ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

AUGUST 1953

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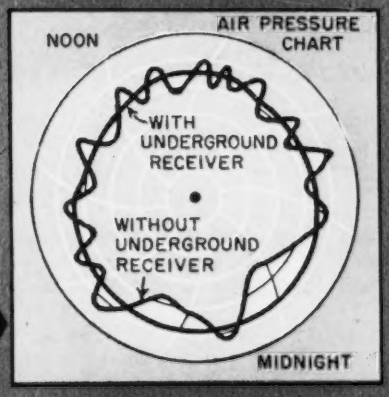
FOUNDED 1866

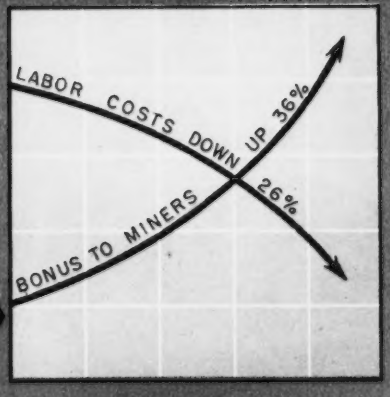
AT MAGMA, mill metallurgists adopt factorial design as standard mill tests prove unreliable . . . . . See p. 97

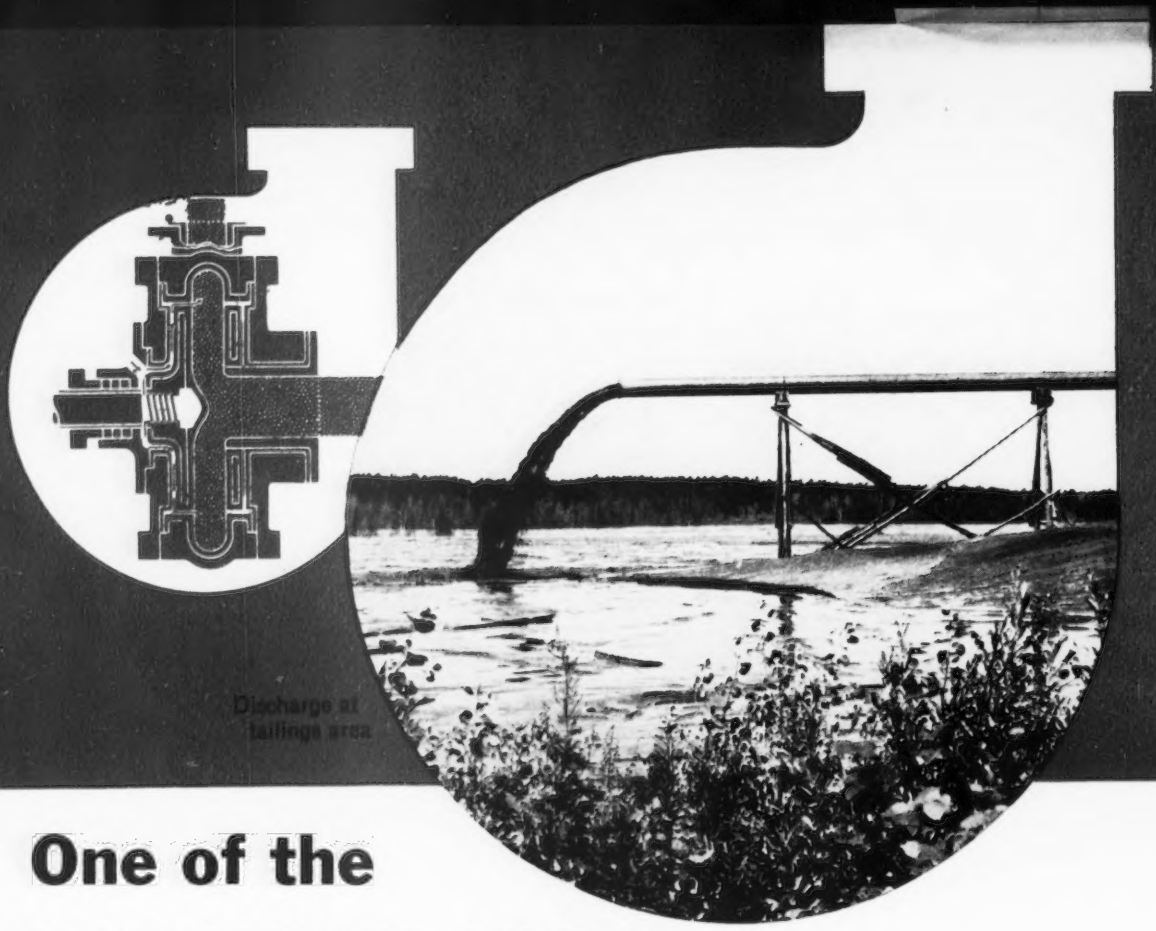
IN NORWAY, an underground "hydraulic" receiver eliminates costly peaks and valleys in compressed air supply...See p. 92



IN NORTHERN RHODESIA, known Copperbelt reserves total 600-million tons of 3.7% copper ore . . . See p. 82

AT GRANBY, compressed-air locomotives help cut drifting costs, increase labor bonuses . . . . . See p. 72





One of the TOUGHEST JOBS in the Mesabi Iron Range

Jobs for pumps don't come much tougher than this, so the assignment was given to a pair of G-Frame Hydroseals. These two big pumps take turns pumping tailings through 7700 feet of 18-inch pipe at the concentration plant of one of Minnesota's largest iron-ore producers. They handle 446,400 gallons of pulp per hour, the solids amounting to 450 long tons per hour. The static lift is 76 feet; the discharge pressure is 100 psi. In spite of the terrific load these pumps carry, maintenance costs are relatively low, owing to the Hydrosealing principle and the use of the amazingly wear-resistant ASH-21 alloy for impeller, shell and suction sleeve.

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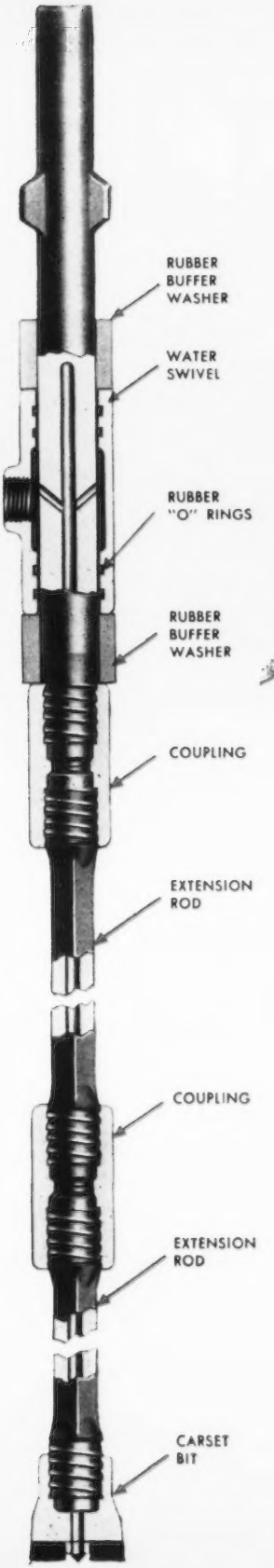

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Carset Jackbits

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The longer-lasting, faster-drilling Carset Jackbit, with practically no gauge wear, has revolutionized deep hole drilling with I-R Drifters and coupled steels. The Carset method is not only much faster, but less costly than when using diamond drills. No special training is needed and the work can be done by regular miners with a minimum of supervision.

To permit the most efficient deep hole drilling with I-R Drifters and Carset bits, Ingersoll-Rand has developed and perfected a *complete line* of accessory equipment—including a water swivel that feeds hole cleaning air and water at high pressure directly into the drill steel without going thru the drill—a rugged, long-lasting coupling with the same threads as the bits—and extra-strong alloy steel extension rods.

This combination of equipment, shown at the left, has proved remarkably successful in a host of deep-hole drilling applications. Ask your nearest I-R representative for the complete story. He can supply *everything you need*—from the bit all the way back to the compressor.

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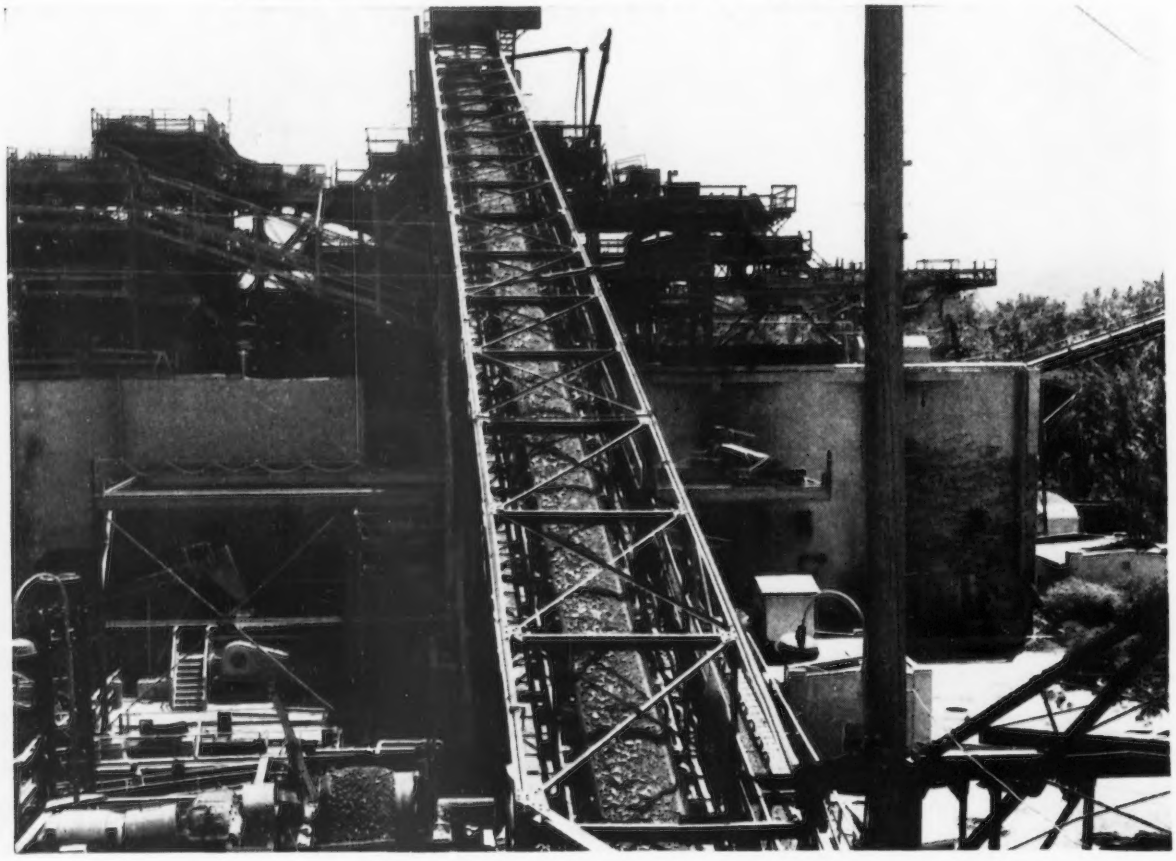
954-15

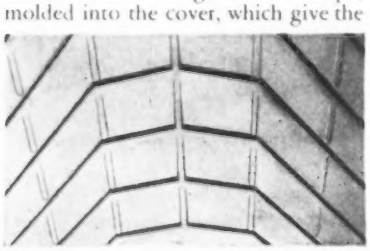
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Wet, slippery gravel climbs uphill on steps of rubber

GETTING tons of gravel up that steep incline was causing plenty of trouble at this plant. A conveyor belt was used but the gravel is so wet it often slipped *down* faster than the moving belt could carry it *up*.

Then a B. F. Goodrich man told the company that BFG had developed a special belt, called Riffle Grip, to meet just such problems. Its cover has a series of extra-tough rubber steps, molded into the cover, which give the belt its nonslip, gripping action. The patented Riffle Grip belt was tried at the gravel company, and as you see, it works perfectly.



Even at the high belt speed needed to move 1200 tons an hour, the rubber tread holds the gravel safely, surely. The water runs off to the sides. Yet just by changing the incline angle and adjusting the troughing idlers, this same BFG belt can haul such sloppy materials as wet mixed concrete and keep the water from draining away.

The B. F. Goodrich Riffle Grip belt is now at work in other gravel plants, on gold dredges, in concrete plants and other places where wet, sloppy materials must be carried up steep grades. It's making many mining and construction jobs cheaper, more efficient. To get further information on the unusual Riffle Grip belt, simply send the coupon below, or call in your nearest BFG distributor.

The B. F. Goodrich Company
Dept. M-73, Akron 18, Ohio

Without cost or obligation, please

- ☐ send me more information on the Riffle Grip belt.
- ☐ have a BFG distributor call on me

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B.F.Goodrich

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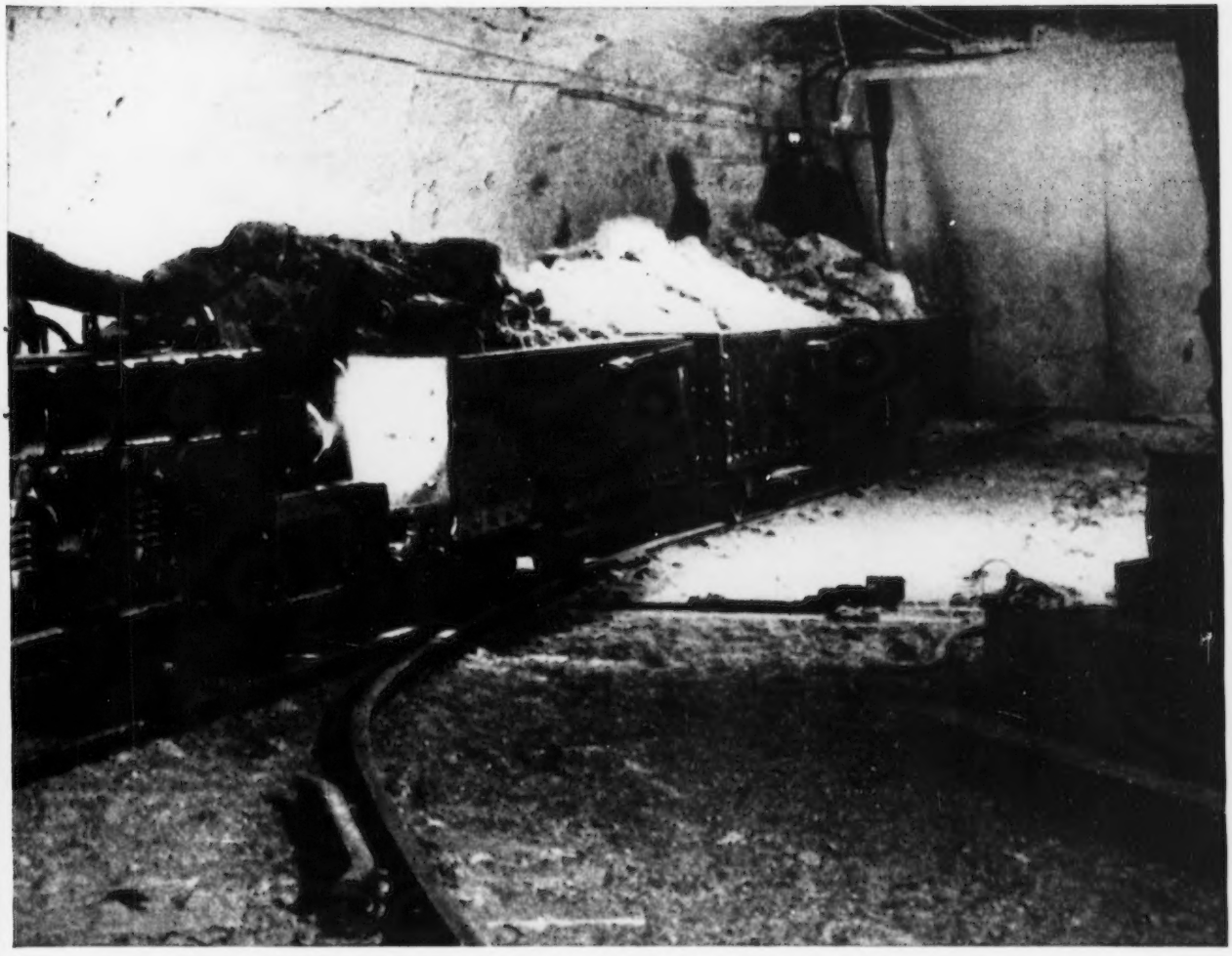
STARTING'S EASIER *all year 'round*

TEXACO

TEXACO



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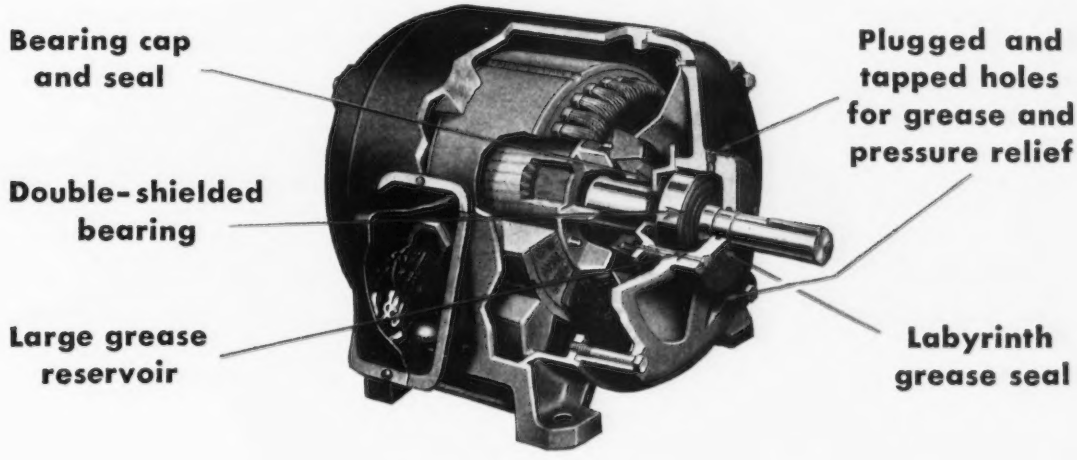
MINING PUMPS

Here Are Facts You Should Know About Electric Motor Bearings

An ideal motor bearing would operate for indefinitely long periods under all types of conditions without requiring any attention whatever. However, in the opinion of our engineers, such a bearing and its attendant lubricant are not yet available on the commercial market. Consequently, bearings for many types of operations, particularly where overloading, extreme temperature ranges and chemical and dirt laden atmospheres are involved, require special lubricants or regular lubrication schedules.

Of course, bearings suitable for many kinds of operation under normal conditions can be built to require no attention for very long periods — usually several years. Allis-Chalmers can supply sealed bearings in all frame sizes through 505 on short delivery and without extra cost for applications of this type.


Bearing cap and seal
Double-shielded bearing
Large grease reservoir
Plugged and tapped holes for grease and pressure relief
Labyrinth grease seal

Which is the Best Design for *Your* Application?

But, we believe that the design used in standard Allis-Chalmers drip-proof, tefc and explosion-proof motors represents the best design for most industrial users.

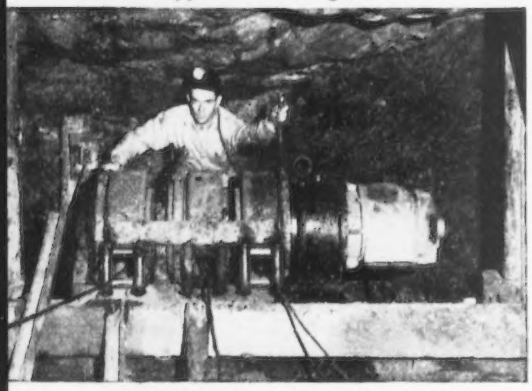
The Allis-Chalmers standard design consists of a prelubricated, double-shielded bearing mounted in the end housing with a generous grease reservoir. Plugged and tapped holes are provided for grease and for pressure relief. Under normal operating conditions, this design will operate as long without attention as any other type of bearing in use today. But where difficult operating conditions make relubrication desirable, it can be done as part of the normal lubricating-routine without dismantling the motor.

The large grease reservoir and shielded bearing design assure that grease lost from the bearing due to high operating temperatures or other causes will be replaced automatically.

For further information on bearing design and other features of Allis-Chalmers motors, call your nearby Allis-Chalmers District Office or Authorized Distributor. A-4130

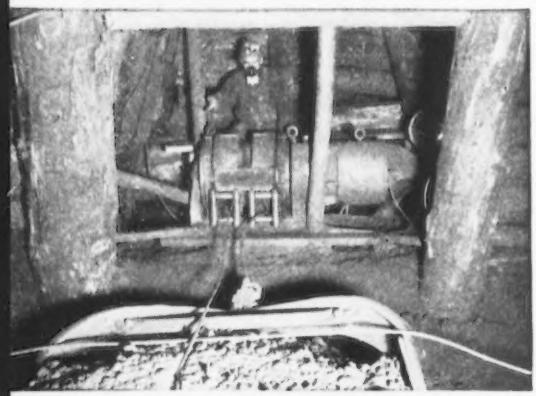
ALLIS-CHALMERS

JOY AAF-211 *double-drum slusher in a lead-zinc mine. Mounted on a turntable, scrapes alternately from two headings.*



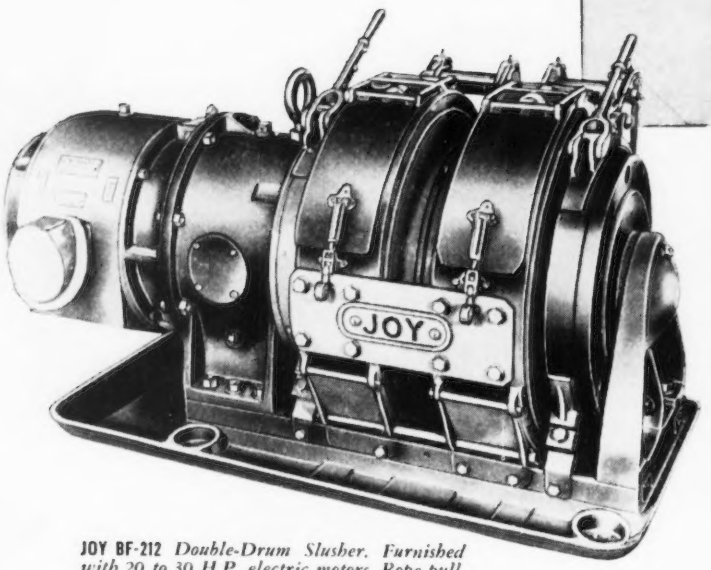
JOY AF-311 *three-drum slusher in a large open stope in a western copper mine.*

JOY AAF-211 *double-drum slusher in a cut-and-fill stope in a copper mine.*

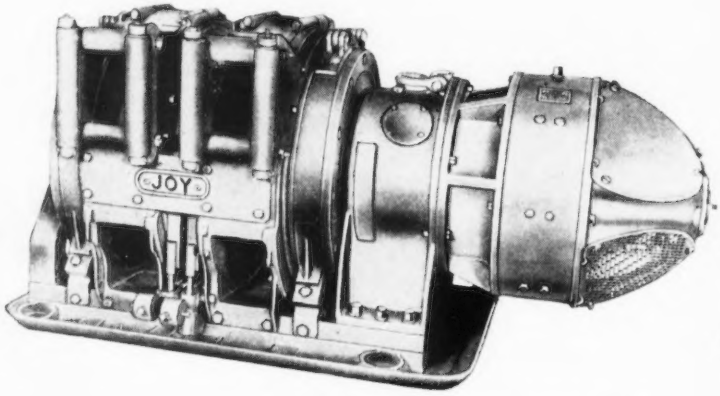


JOY BF-211 *double-drum slusher pulling ore to a chute in a Michigan iron ore mine.*

Here's why



JOY BF-212 *Double-Drum Slusher. Furnished with 20 to 30 H.P. electric motors. Rope pull, with drum half-full of rope, up to 3700 lbs.*



JOY CF-211 *Double-Drum Slusher. 30 to 60 H.P. electric motors. Rope pull up to 6800 lbs., with drum half full of rope.*

AMSCO SCRAPERS . . . built entirely of high (13%) manganese steel for longer life and lower maintenance. Three models—lightweight unit-type, medium weight welded-type, and heavy weight bolted-type, in sizes from 26" to 72".

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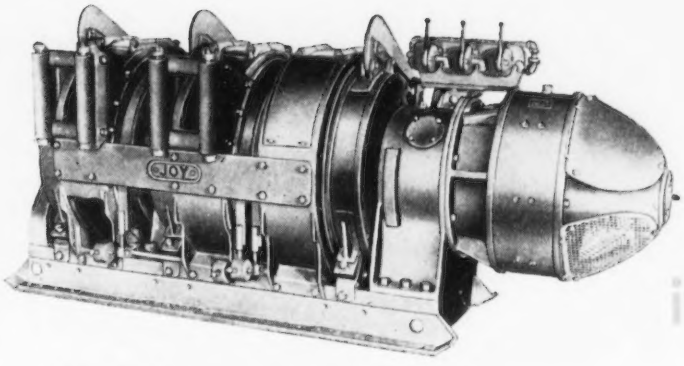

JOY CF-312 *Three-Drum Slusher equipped with air-clutch control for ease of operation. Electric motors from 30 to 60 H.P. Rope pull, with drum half-full of rope, is up to 6600 lbs.*

They're used and preferred in every mining field—because:

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VAL D'OR, QUE., FRIDAY NOVEMBER 28, 1952
Page 17
So You're Opening A Mine, Y
--2,750
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The Largest Initial Milling and Concentrating Plant Ever Put In Operation in Canada

Barvue Mines Limited, near Barraute, Canada is Quebec's largest base metal producer. The Barvue mill handles 4,000 tons of ore per day and the No. 48 Agitair rougher cells play a vital roll in the production of 200 tons per day of 60% zinc concentrate. Expansion plans for the immediate future include an iron pyrite section that will boost production another 250 tons per day and require additional banks of No. 48 Agitair machines.

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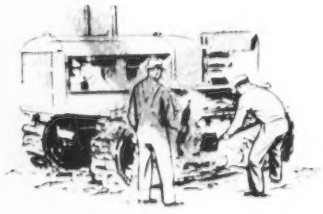
This forward progress is a continuing program. Additional improvements are constantly being incorporated into the HD-5, HD-9, HD-15 and HD-20 tractors. If you are in the market or just interested, see your Allis-Chalmers dealer for all the inside facts that have proved so popular with owners as well as operators and mechanics.



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On all Allis-Chalmers tractors, you can operate six months on a 40-hour week basis with just one lubrication of truck wheels, front idlers and support rollers. Designed with positive seals and tapered roller bearings, these units are protected from dust, loose sand, soft ground, mud or water. You not only gain working time, but save labor and lubricant costs as well. And there's no costly damage from greasing neglect

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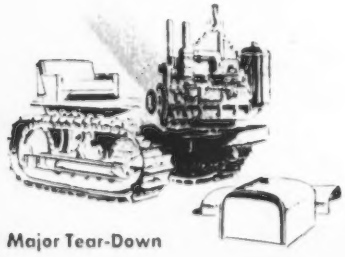
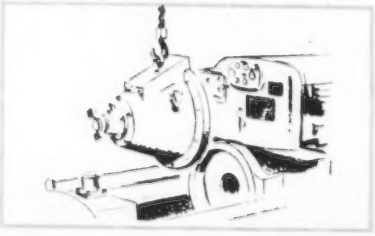
Hydraulic Steering and Self-Energizing Brakes

Allis-Chalmers HD-15 and HD-20 tractors are equipped with fingertip hydraulic booster steering — operator exerts only 3 to 5 lb. pressure on the controls. As a result he gets small tractor maneuverability from these 27,850 and 41,000-lb. crawlers and can concentrate on his work. All four models are equipped with self-energizing brakes. These require less pedal pressure and take hold with a firm, uniform grip for accurate control.



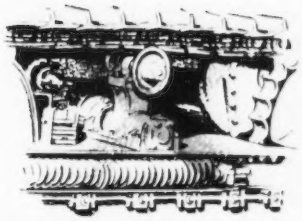
Major Tear-Down

Unit Servicing

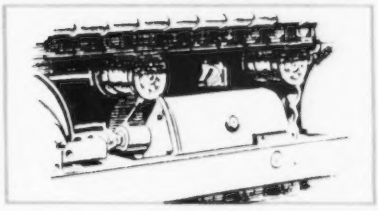


No need to remove transmission or engine, radiator, grille, etc., when servicing or removing an Allis-Chalmers master clutch. The unit assembly principle also applies to final drive gear, transmission, steering clutches, engine and truck frame. As a result, hours of costly service and down time are saved because of Allis-Chalmers advanced design.

Oil Enclosed Track Release Mechanism

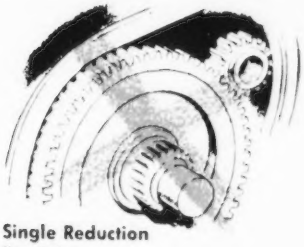


Open or Partly Shielded
Track Release Mechanism



Operating in oil and *sealed* against dirt and moisture, the Allis-Chalmers track release mechanism seals out mud, ice and debris. Because it's completely sealed, the release mechanism is in working condition at all times — providing positive protection when obstacles jam into the tracks.

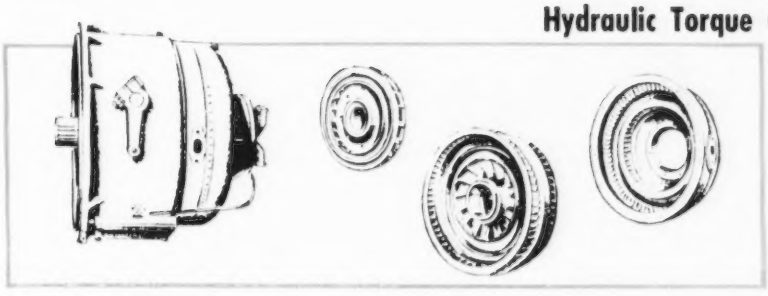
Double Reduction Final Drive



Single Reduction
Final Drive

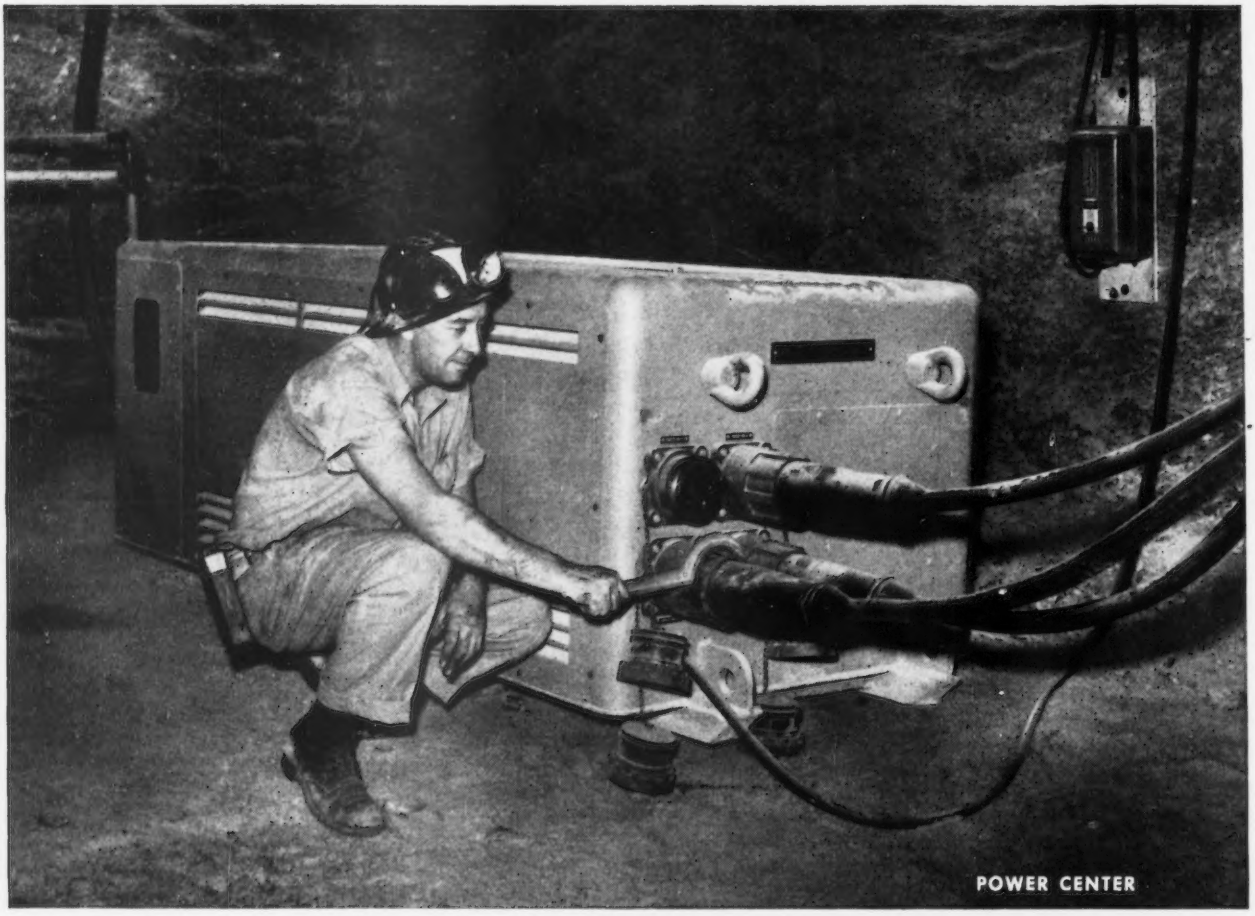
With smaller gears and shorter shafts, double reduction final drives provide better bearing and gear alignment. The "live" axle permits smaller, more serviceable seals. Equally important, double reduction drive provides for smooth, clean bottom construction and the extra ground clearance so necessary on rough terrain.

Hydraulic Torque Converter Drive

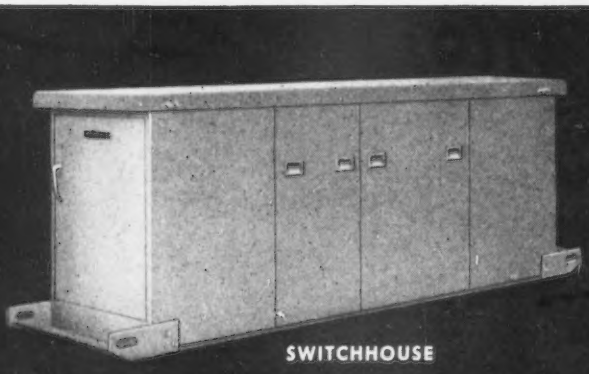


The Allis-Chalmers HD-20 is the only crawler tractor in the industry where torque converter is standard equipment and part of the tractor's basic design. With torque converter there is greater pay load capacity because this unit automatically balances travel speed to the load — no idle horsepower, no worry about engine stalling. And with most shifting eliminated, there's far less operator fatigue.

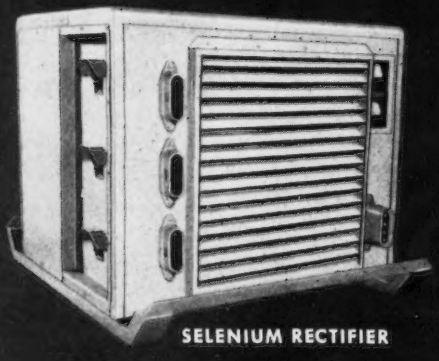
ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.



POWER CENTER



SWITCHHOUSE



SELENIUM RECTIFIER

IGNITRON RECTIFIER SUBSTATION

Skid ém in...hook ém up!

...Westinghouse "plug-in" power packages come ready for work

No further engineering needed! No planning of related equipment necessary! Whether you use a-c, d-c or a combination of both in your mine, Westinghouse underground "power packages" are available for your needs. These complete integrated units can save you days or even weeks of installation time. They are shipped to you ready to use. Compactness and portability make it easy to move them close to the load, minimizing power losses and voltage fluctuations which result from long cable runs. Plug-type receptacles make hookup fast and easy.

Switchhouses protect high-voltage a-c circuits

Westinghouse switchhouses control high-voltage a-c circuits to high-voltage motors or power centers. Each switchhouse is equipped with a circuit breaker which automatically disconnects the circuit in case of overloads, short circuits or ground faults. Thus, trouble is isolated without impairing service to other sections of the mine.

Power Centers step down a-c power for smaller machines—Underground power centers provide low voltage close to the load. They include dry-type, air-cooled transformers which eliminate the problems connected with liquid cooling. Circuit breakers protect each outgoing low-voltage feeder. Plug-type connectors are provided for all incoming high-voltage and outgoing low-voltage circuits.

Ignitron Rectifiers supply large amounts of d-c power

For large blocks of d-c power, above 150 kw, Ignitron rectifier substations provide the most reliable and economical method of power conversion. They are delivered complete with nothing else to engineer or buy. Simply connect up the incoming a-c line and outgoing d-c cables and you are in business. Over 450 such Westinghouse units are rendering outstanding service.

Selenium Rectifiers furnish small blocks of d-c power

Westinghouse selenium rectifiers are the answer to your need for small amounts of d-c power. All you do is skid the unit to the working face, plug in the a-c current on one side and take d-c power off the other. The unit contains all the necessary apparatus in one compact package.

Which equipment will do the best job for you?

Remember, continuous mining starts with continuous power. Your Westinghouse representative can help you attain better production by studying your electrical needs and recommending the units best suited for your operations. Call him or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-94999

YOU CAN BE **SURE**...IF IT'S

Westinghouse

SPEED where it saves you most

Here a Bucyrus-Erie drill pounds out hole on a copper mining operation. Derrick head shock absorber protects machinery from vibration — reduces cable wear by keeping shock loads down. A Bucyrus-Erie "first" the rubber shock absorber is the most successful yet devised.

Bucyrus-Erie blast hole drills have a nation-wide record for ramming holes down fast—and cheap. A brief rundown shows why—

Big 5⅝ to 12-in. holes—quick— The right balance of tool travel distance, tool weight, and blows per minute — combined with an unmatched rock shattering snap at the impact point — put these rigs "holes ahead" in penetration speed.

Quick moves — Long, sure-footed crawlers mean fast, easy rolling over rough ground — positive traction up 30 percent grades.

Rapid set-ups — Hydraulic leveling jacks (standard on 50-T; optional on 29-T) eliminate elaborate ground preparations, blocking and cribbing. Built-in stabilizing jacks (on the 22-T, 27-T and 29-T machines) provide time-saving 3-point setups even under adverse ground conditions.

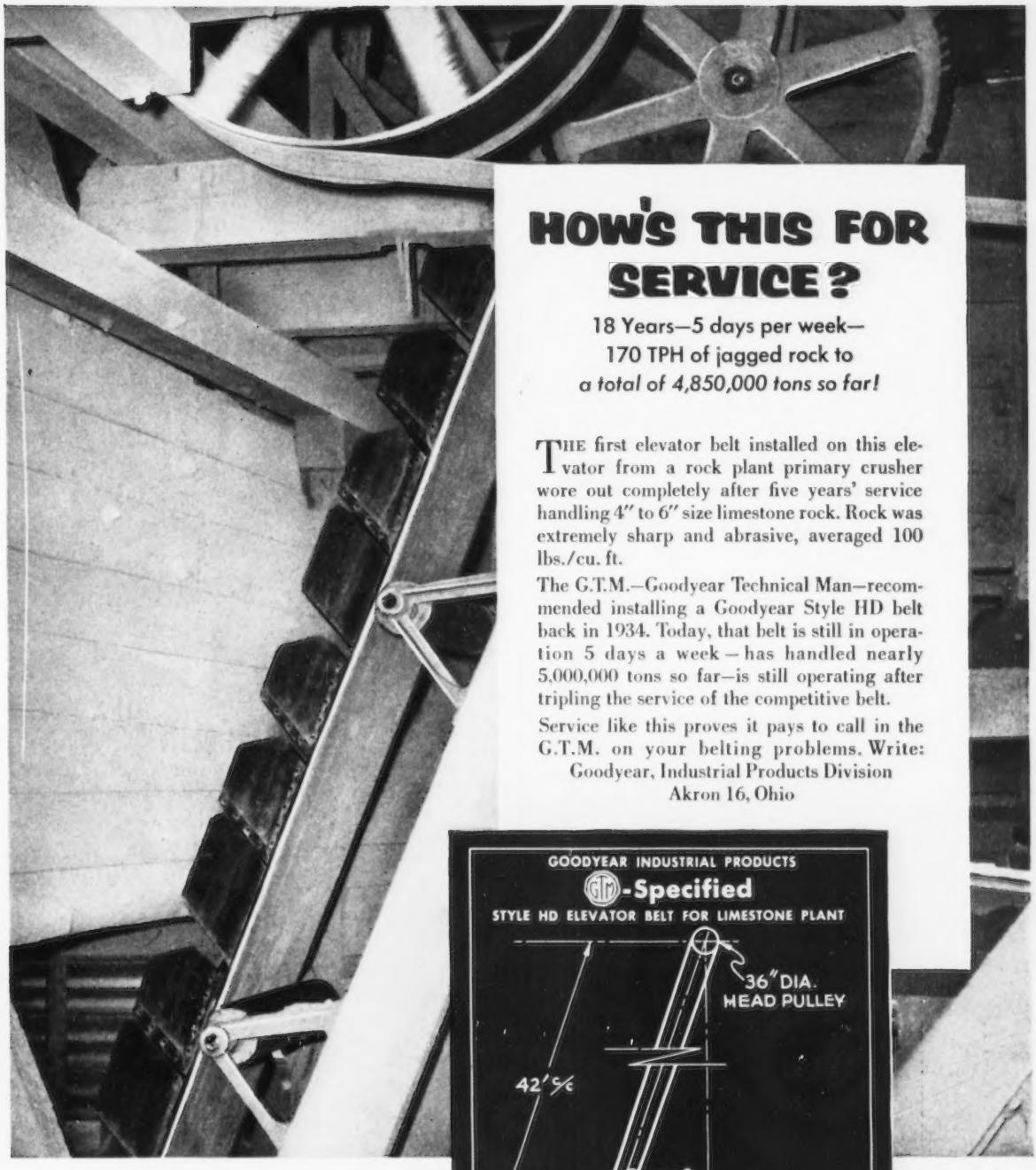
Close-grouped controls — Easy handling levers are positioned close together for convenient reach. A driller can run this rig at top speed for long periods without slow down. Built-in tool wrenches (on all except 22-T) safely speed tool changing.

For fast, profitable operation standardize on big hole, fast hole Bucyrus-Erie drills. Four models—5⅝ to 12-in. hole capacities.

6B53

BUCYRUS-ERIE COMPANY

South Milwaukee, Wisconsin



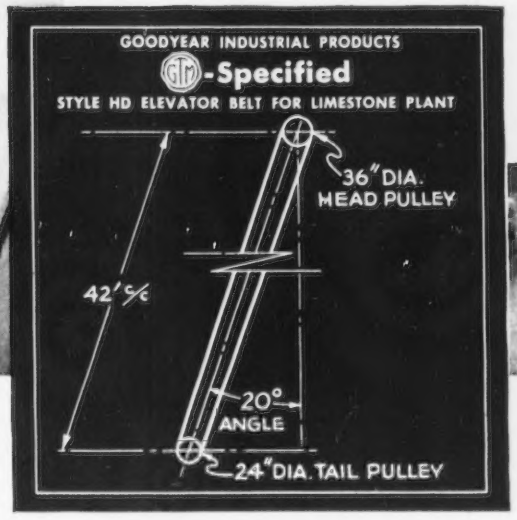
HOW'S THIS FOR SERVICE?

18 Years—5 days per week—
170 TPH of jagged rock to
a total of 4,850,000 tons so far!

THE first elevator belt installed on this elevator from a rock plant primary crusher wore out completely after five years' service handling 4" to 6" size limestone rock. Rock was extremely sharp and abrasive, averaged 100 lbs./cu. ft.

The G.T.M.—Goodyear Technical Man—recommended installing a Goodyear Style HD belt back in 1934. Today, that belt is still in operation 5 days a week—has handled nearly 5,000,000 tons so far—is still operating after tripling the service of the competitive belt.

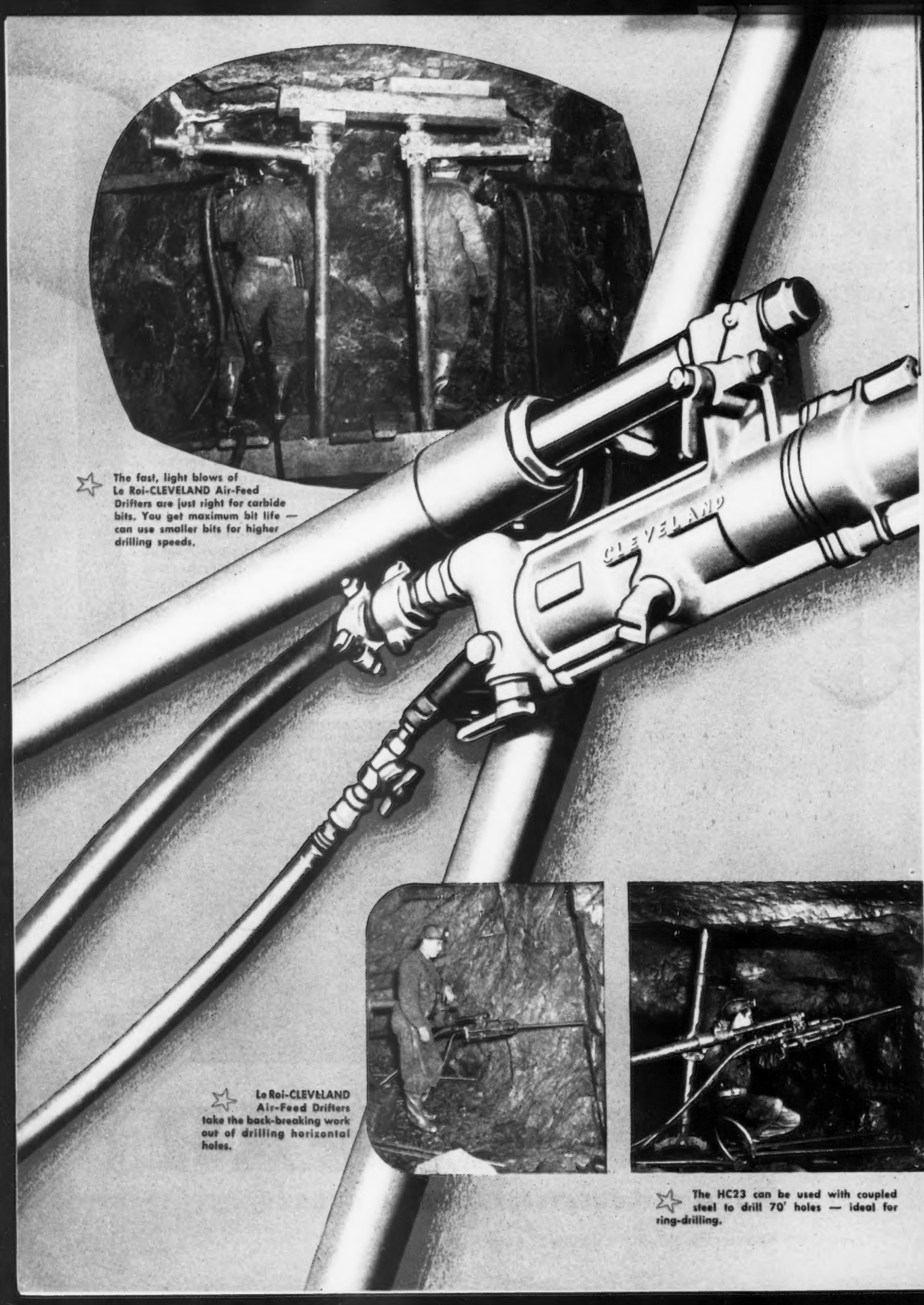
Service like this proves it pays to call in the G.T.M. on your belting problems. Write: Goodyear, Industrial Products Division, Akron 16, Ohio



YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, V-Belts, Packing, Tank Lining, Rubber-Covered Rolls: Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

GOODYEAR

THE GREATEST NAME IN RUBBER



☆ The fast, light blows of Le Roi-CLEVELAND Air-Feed Drifters are just right for carbide bits. You get maximum bit life — can use smaller bits for higher drilling speeds.

☆ Le Roi-CLEVELAND Air-Feed Drifters take the back-breaking work out of drilling horizontal holes.

☆ The HC23 can be used with coupled steel to drill 70' holes — ideal for ring-drilling.

Tonnages go up!

Drilling costs go down!

with Le Roi-CLEVELAND Air-Feed Drifters

YOU lighten the load on miners — take the hardest part of the work out of drilling — when you equip them with Le Roi-CLEVELAND Air-Feed Drifters. Men don't tire so fast — safety records improve — tonnages rise.

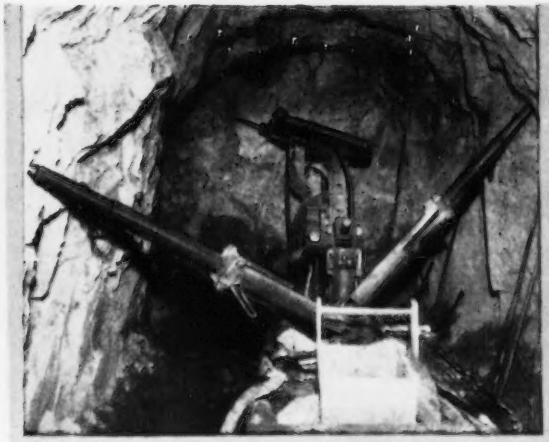
Here are some reasons why: (1) You can use the Model 83 lightweight pneumatic air column to speed set-ups. (2) Fast reverse feed makes changing steels quick and easy. There are no swing or dump nuts to loosen or tighten. (3) Positive air feed gives right pressure for maximum drilling speed. (4) Fast, light blows are just right for carbide bits.

Le Roi-CLEVELAND Air-Feed Drifters are available in two sizes: HC10R with $2\frac{5}{8}$"-bore machine and HC23R with $3\frac{1}{8}$"-bore machine. See how either model gives you longer bit life, lets you use smaller bits for higher drilling speeds — helps you get higher man-shift production, greater safety, and lower drilling costs. Write for further information.

LE ROI COMPANY CLEVELAND ROCK DRILL DIVISION

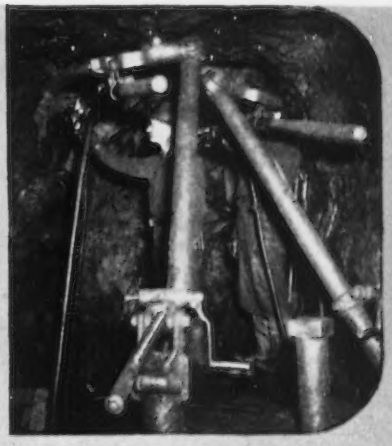
A Subsidiary of Westinghouse Air Brake Co.
Plants: Milwaukee, Cleveland and Greenwich, Ohio

12500 Berea Road, Cleveland 11, Ohio



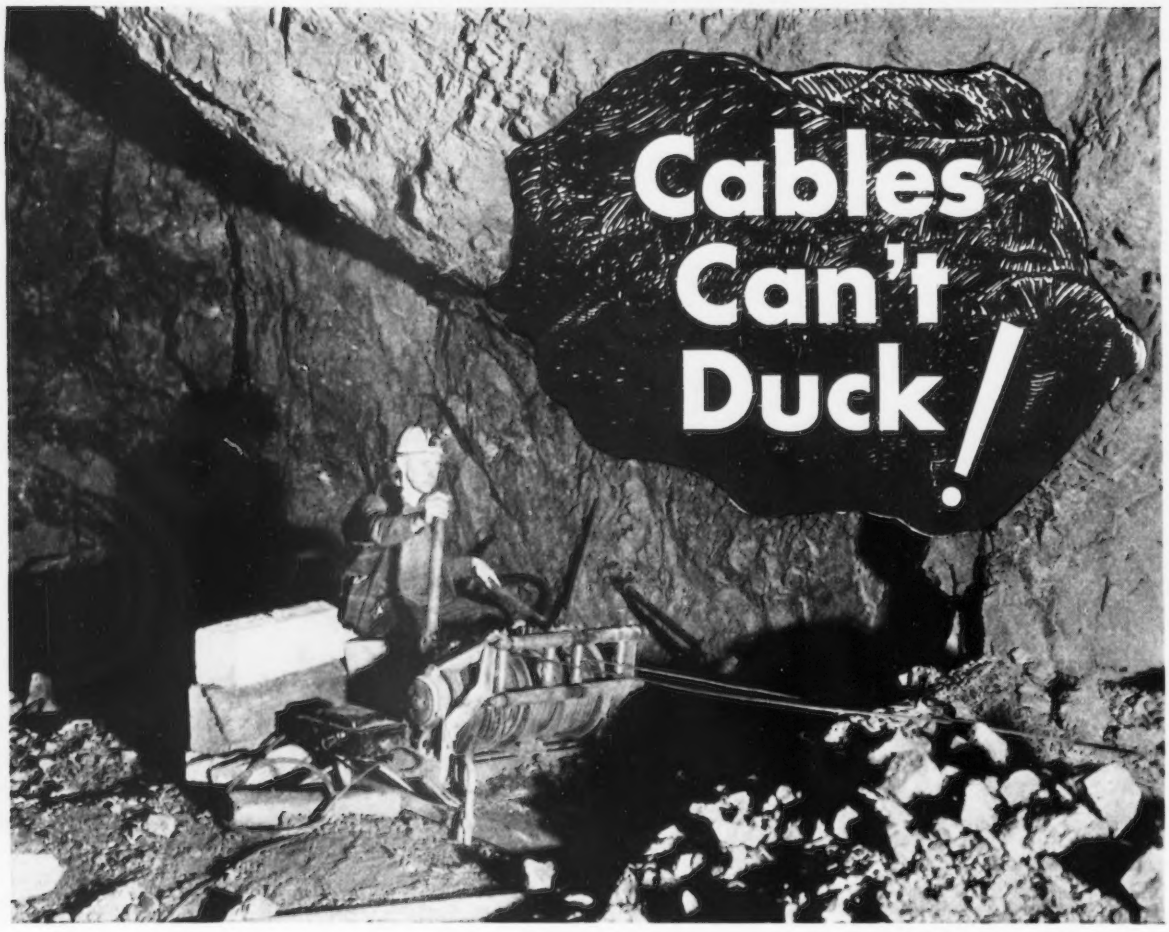
☆ Le Roi-CLEVELAND Air-Feed Drifter mounted on air-motor-powered boom of Le Roi-CLEVELAND Self-Leveling Mine Jumbo in a Western zinc and copper mine.

☆ Feed controls are conveniently located on Le Roi-CLEVELAND Air-Feed Drifters. Reverse air feed withdraws steel from hole quickly.



☆ The accent's on production in this mine. Le Roi-CLEVELAND Air-Feed Drifters make possible faster set-ups, faster steel changing, faster drilling.

RD-50



Portable cables for slusher hoists can't duck flying pieces of ore, spalling rock, water and mechanical abuse. They have got to stay put and take it. For these reasons you need more than a good power cable; you need the best that money can buy. Cables that can stand up under these tough operating conditions are the only kind that can help turn in a profit. The profit-making, loss-preventing kind is TIREX.

Simplex-TIREX power cables have a *tough, cured-in-lead, selenium-neoprene armor* to assure extra-long life. This special armor gives balanced resistance to abrasion, water, grease, oil and flame. It is this special balance of properties that makes TIREX Cables last longer and thus enables you to scrape more tons of ore.

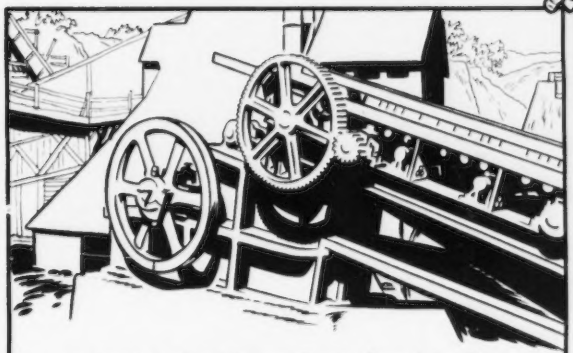
Remember to specify and get Simplex-TIREX Cables for all your portable operations, including slusher hoists. These cables are marked "Simplex-TIREX" for your protection.

Simplex WIRES & CABLES

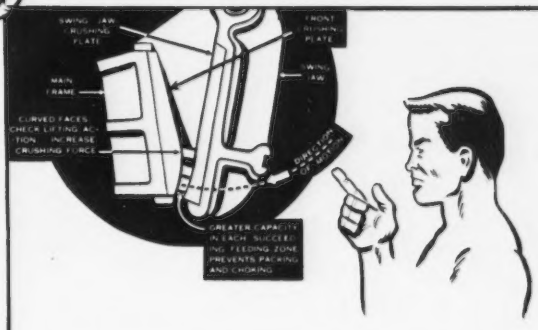
SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Crushing Power

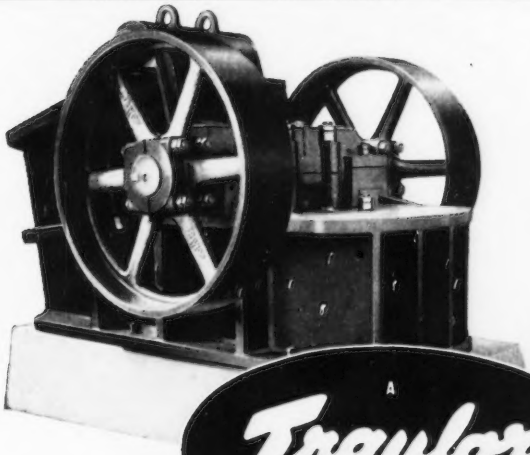
Traylor Jaw Crushers, with their curved jaw plates, throttle rising costs.



In hundreds of installations, Traylor Curved Jaw Plates have out-lasted conventional plates 3 to 1. Designed to wear evenly over all . . . they retain their original curved surfaces indefinitely.


SWING JAW CRUSHING PLATE
FRONT RUSHING PLATE
MAIN FRAME
SWING JAW
CURVED FACES CHECK LIFTING ACTION — INCREASE CRUSHING FORCE
GREATER CAPACITY IN EACH SUCCEEDING FEEDING ZONE PREVENTS PACKING AND CHOKING

With Traylor's original curved jaw plates, choking and packing are virtually eliminated by the increased capacity of each succeeding feeding zone in the crushing area.



A **Traylor** LEADS TO GREATER PROFITS

SURE . . . I want to pin down rising costs with continuous trouble-free jaw crusher production. Send me complete specifications and descriptions on TRAYLOR Jaw Crushers!

Name: _____

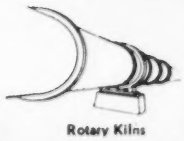
Position: _____

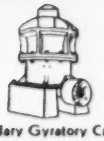
Company: _____

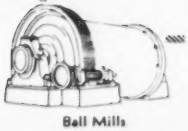
Address: _____ State: _____

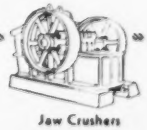
TRAYLOR ENGINEERING & MANUFACTURING CO.
1512 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

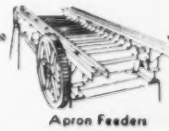
Primary Gyratory Crushers


Rotary Kilns


Secondary Gyratory Crushers


Ball Mills


Jaw Crushers


Apron Feeders

LOADING IN RECORD TIME

Contractors on high speed jobs and mining companies on regular production or development work prefer Eimco 40H loaders for faster, more dependable loading.

On high speed jobs they prefer the Eimco 40H for maximum loading of large cars and to keep the loading portion of the cycle shorter than drilling time.

On a recent high speed tunnel the time consumed in moving the 5 machine jumbo to the face and drilling was 65 minutes with no time charged for moving the jumbo out during the powder loading operation while time consumed for moving the loader in, loading and moving the loader out was only 55 minutes.

The 40H is a heavy-duty machine for operation under the most severe conditions. Other Eimco loaders are made to fit any loading condition with capacities to 450 yards per minute.

EIMCO

Eimco 12B

Eimco 21

Eimco 104

THE EIMCO CORPORATION

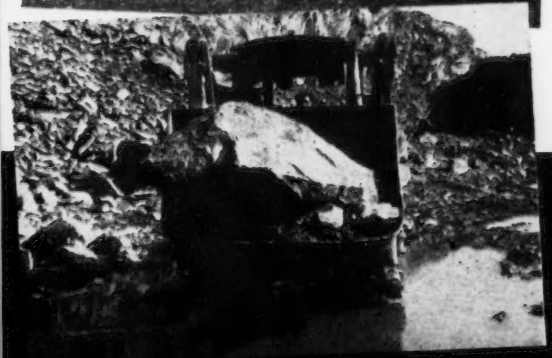
The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE. • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIF., 637 CEDAR STREET
KELLOGG, IDAHO, 307 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY: EIMCO ITALIA, S.P.A., MILAN, ITALY



ROUGH—TOUGH JOBS—SPECIFY EIMCOS

When jobs are tough — it's more imperative than ever that an Eimco be selected to do the job.

Eimcos are built heavy, for dependable operation on the roughest, toughest jobs; for handling rock, sticky clay, gravel or any combination of hard to load materials.

With Eimcos you get a faster loading cycle — forward to dig and load back to discharge into the truck or railroad car. This action makes it easier on tracks and rollers for less maintenance and repair.

Quantities loaded can run from 300 to 350 yards per hour depending on your conditions.

Let an Eimco representative show you a machine working near you. Write for more information.

You can't beat an Eimco

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

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IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY: EIMCO ITALIA, S.P.A., MILAN, ITALY

Operator reports:

One of 3 Euclid twin-engine scrapers. Twin application is made possible by Allison TORQMATIC DRIVES.

25,900 trouble-free hours!

BACK in July 1950, the George M. Brewster Company, Inc., put to work three 18-yard scrapers equipped with Allison TORQMATIC DRIVES. At the same time, this New Jersey contractor converted four 13-yard bottom-dump trucks from mechanical drives to TORQMATIC DRIVES.

And to date these seven units have piled up 25,900 trouble-free hours—a record far surpassing experience with mechanical drives.

This high-availability record has paid big dividends by lowering operating costs. Performance records like this tell why many operators are now insisting on Allison TORQMATIC DRIVES in their new equipment. If you are not familiar with all the advantages of these drives, get the full details from your equipment manufacturer or dealer or write to:

ALLISON *Division of* GENERAL MOTORS
Box 894MM, Indianapolis 6, Indiana

ALLISON TORQMATIC DRIVES

Unbeatable Team for Maximum Operating Economy

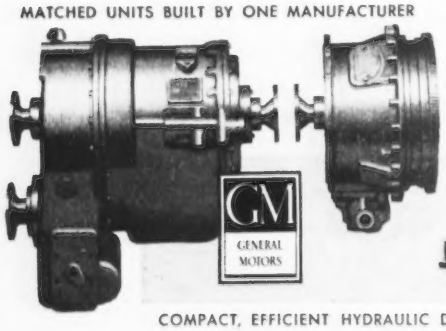
✻ *Quick-shifts* at full throttle with fingertip hydraulic control.

✻ *Holds* power to load at all times—no clutch pedal to push—no gearshift guess.

✻ *Cuts* maintenance cost by absorbing shock—eliminates engine lugging—prolongs equipment life.

✻ *Only* torque converter-transmission team designed to work as a unit and built by one manufacturer.

MATCHED UNITS BUILT BY ONE MANUFACTURER



Allison TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES • TRUCKS • TRACTORS • SHOVELS • SCRAPERS • DRILLING RIGS

IF YOUR PROBLEM IS HAULAGE

write for MANCHA'S

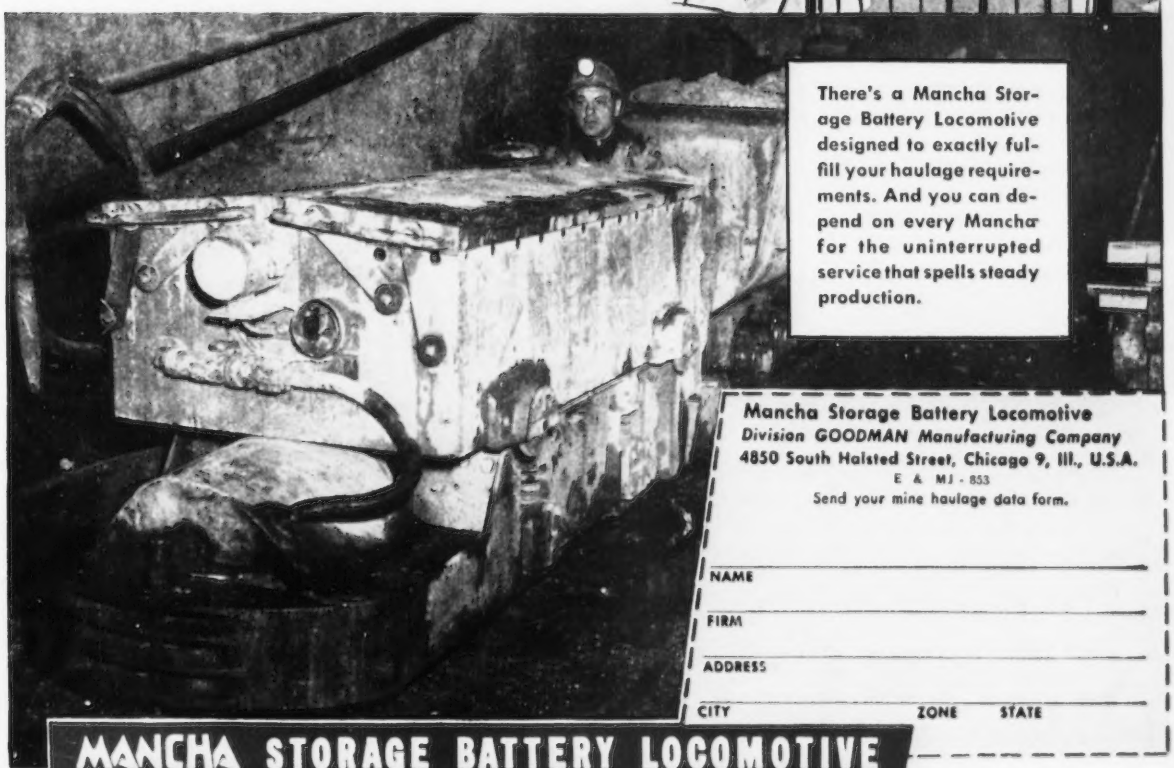
MINE HAULAGE DATA FORM

It costs you nothing

This Data Form contains a carefully studied outline of questions concerning haulage systems. You fill it in, using the facts applying to your own conditions and requirements, then return it to us.

Without cost or obligation to you, Mancha engineers will analyze the information you submit, and tell you the maximum output that can be obtained in your mine with Mancha Storage Battery Locomotives. Then you can make your own comparisons.

Many a mine operator can trace a sharp upswing in his haulage efficiency to the analysis he obtained through Mancha's Mine Haulage Data Form service. Whether or not you are in the market for haulage locomotives today—SEND THE COUPON!



There's a Mancha Storage Battery Locomotive designed to exactly fulfill your haulage requirements. And you can depend on every Mancha for the uninterrupted service that spells steady production.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ - 853
Send your mine haulage data form.

NAME _____

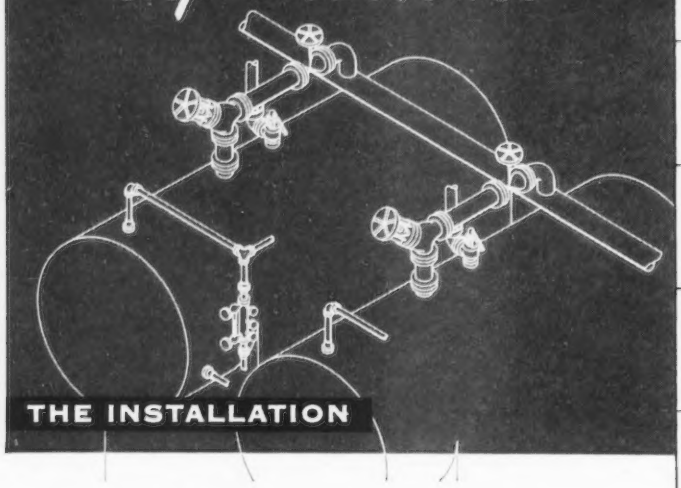
FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division GOODMAN Manufacturing Company
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

30 Years of Safety and Efficiency with these High Quality Stop-Check Valves



THE INSTALLATION

At the Eureka Redwood Lumber Company, Eureka, Calif., featuring eight 5-in. Crane stop-check valves on boiler lines to main steam header.

VALVE SERVICE RATINGS

SUITABILITY:	On the job for 30 years
FEATURES:	Only one moving part
MAINTENANCE COST:	One seat regrinding only
SERVICE LIFE:	Installed 1923—still O.K.
OPERATING RESULTS:	Efficient performance—safe operation
AVAILABILITY:	Crane Catalog item—No. 30E

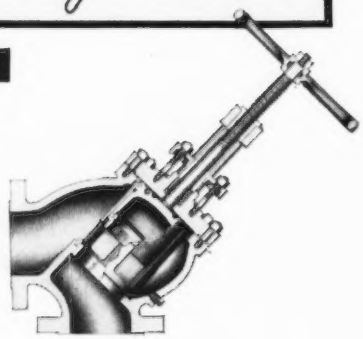
THE CASE HISTORY

Thirty years' continuous service is by no means the record for Crane 250-Pound stop-check valves. But when 6 such valves, all installed in 1923, are still on the job, and still giving complete satisfaction, surely that's worthy of note. So well did these Crane No. 30E stop-checks perform right from the start, that 11 years later, in 1934, 2 more were put on boilers installed that year.

Here are 8 valves with a collective service record of more than 220 years. And in all that time, the only maintenance required was regrinding the seat of one valve.

It takes a lot of quality to deliver such valve performance with so little upkeep. That's why today, in face of rising maintenance cost, Crane quality is more than ever the first choice of the thrifty valve buyer.

THE VALVE



Simplicity and dependability are still the chief characteristics of Crane 250-Pound stop-check valves. They have just one moving part—the piston-type disc that operates in a removable liner, without chatter, vibration, or rapid wear. You'll have a safer power plant with these valves on your boilers, and they'll permit steam flow to the main header at minimum pressure drop. See your Crane Catalog or Crane Representative for complete information.

THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT: Calol Red Engine Oils

UNITS: Bearings — Crushers and ball mills

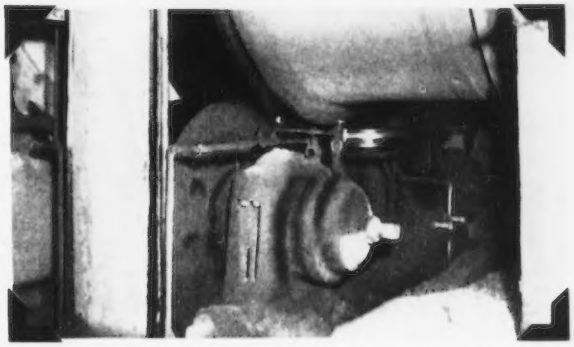
LUBRICATORS: Circulating & Drip feed

CONDITIONS: Extreme shock loads

LOCATION: Arizona

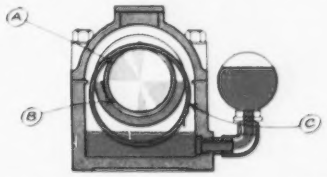
Stable oil cuts deposits in ore-crusher bearings!

CALOL RED ENGINE OILS in these ore-crusher and ball-mill bearings provide good lubrication and hold deposits to the minimum, although loads are tremendous and oil temperatures have gone as high as 155°F. They are used throughout the big Arizona plant—which handles more than 25,000 tons of ore per day—where these pictures were taken. Using as much as 40,000 gallons of Calol Red Engine Oils in a year, the plant operators have found them to be uniform and satisfactory over many years. Specially refined to provide adequate, economical lubrication under tough conditions, Calol Red Engine Oils will reduce wear and save maintenance costs in your mill or other industrial operation. These stable mineral oils come in different grades to meet varying conditions and wide range of operations.



FOUR BEARINGS in trunnion wheels, like this, support about 100 tons when ball mills are charged with ore. Calol Red Engine Oil is applied to the 8½"x16" journals by drip-feed, as shown. Circulated through lines, it is filtered and re-used.

How CALOL Red Engine Oils cut industrial lubrication costs



A. Solvent-refined selected mineral oils. Exceptional stability prevents formation of deposits and assures lubrication.

B. Have low carbon residue and pour tests —provide wide range of application in external lubrication of general industrial machinery.

C. Pick up well on ring oilers, may be applied by all types of oiling systems.

FREE CATALOG: "How to Save Money on Equipment Operation," a booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

CALOL

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

Sanford-Day... the mining industry's Super

POTASH CAR BUILT BY SANFORD-DAY . . . This car shown at right is one of the S-D Automatic Bottom Dumping Cars built for U. S. Potash Co. for their Carlsbad Mine. We built these cars of one-half inch steel for heavy duty performance. The car represents another Sanford-Day development toward extending the life of cars in tough service, to increase haulage efficiency and reduce maintenance costs.

SALT CARS BUILT BY SANFORD-DAY . . . Shown at left are the S-D Automatic Bottom Dumping Mine Cars built by Sanford-Day for Leslie Salt Company many years ago. These cars, constructed of wood to handle salt, are still in operation. They are an example of the emphasis Sanford-Day places on the important details of construction to enable you to obtain more years of service from your cars.

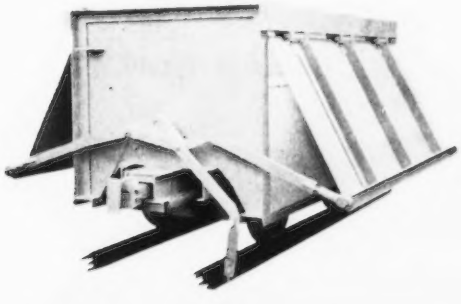
SANFORD-DAY IRON WORKS,

Market for mine cars!

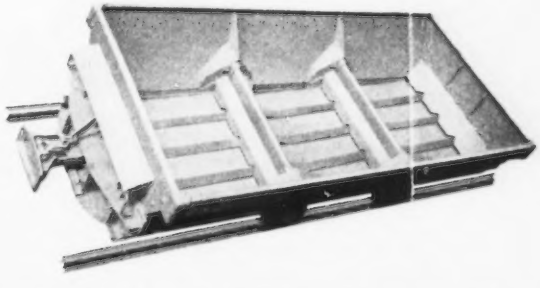
When you need mine cars you want cars built to meet your own requirements. Sanford-Day is your Super Market for mine cars.

We have listed above many of the various purposes for which we have built mine cars. The photos on these pages show a few of the many types of cars we have built for metal and non-metallic mines.

Regardless whether you need one car or 101, don't hesitate to get one of our engineers into your mine with your officials—face to face with your problem. With this type of cooperation, plus our facilities and capacity to build any type mine car of any size, any haulage problem in your mine can be solved.



GABLE BOTTOM CAR BUILT BY SANFORD-DAY . . . We show above one of the 101 Sanford-Day Gable Bottom Cars being built for a customer in Nevada. The car features all-welded instead of riveted construction. It has smoother bottom, ends and sides for free flow of materials when dumping.



GYPSUM CAR BUILT BY SANFORD-DAY . . . Here is another S-D Automatic Bottom Dumping Car development for metal and non-metallic mines. This car is one of many specially built for Certain-Teed Products Corp. for hauling gypsum . . . hauling non-stop because S-D Automatics dump on the move. Extra heavy steel plates were used in the construction to absorb shock loads.

After 50 years of leadership in the industry, Sanford-Day still devotes its entire capacity to the production of mine cars. Most improvements in mine cars originate with this company.

KNOXVILLE, TENN.

STURTEVANT

Dustless BLENDERS

Produce Perfectly Mixed Products with NO Loss of Materials

RECEIVING

The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.

DISCHARGING

By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients

Four-way mixing action produces homogeneous blends. No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide *a thoroughly blended product* with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.

STURTEVANT MILL COMPANY
101 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

Catch fish with wire rope?

WICKWIRE ROPE
A CF&I PRODUCT

Yes, gentlemen, there's more fish caught with wire rope than ever nibbled at a baited hook. Satisfying America's appetite for nutritious seafood is a stupendous job, calling for fleets of fast, powerful trawlers that net their catches in prodigious quantities. To hold and haul in the heavily laden nets, the fishing industry annually uses millions of feet of wire rope.

There's a good chance the fish you eat comes to your table with the help of Wickwire Rope. Because, for over half a century, Wickwire Rope has "grown up" with the nation's fisheries. As in so many other activities where wire rope is used, the men who man the fishing fleets have a high regard for its strength and durability under the toughest conditions.

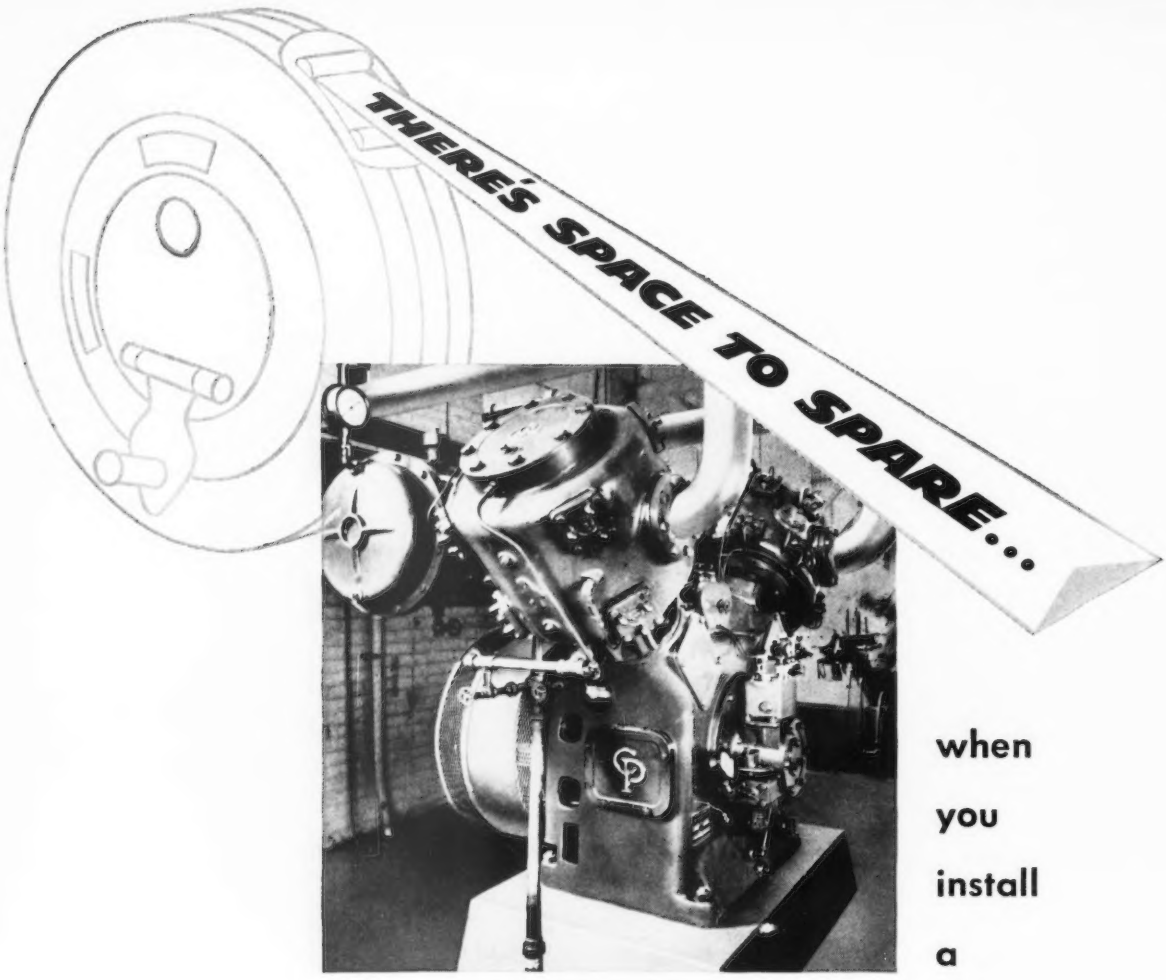
A YELLOW TRIANGLE ON THE REEL IDENTIFIES WICKWIRE ROPE

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver
Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles
Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga
Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia

1757

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION



when you install a

TYPE Y

compressor

Chicago Pneumatic's compact, heavy-duty Type Y Compressor is ideal where space is limited. It takes up minimum floor area, but is designed for continuous heavy service. Shipped as a complete "package" ready for easy installation, it requires the simplest of foundations — needs no alignment.

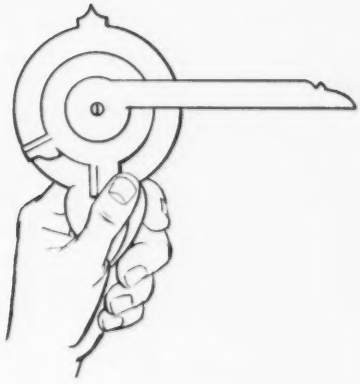
The highly efficient Type Y Compressor has roller main bearings, precision connecting rod bearings, multi-step capacity regulation, and an easy-to-clean shell-and-tube intercooler.

Available in sizes from 75 hp to 250 hp, 410 cfm to 1663 cfm, and with flange mounted, belted and coupled motors. Write for Bulletin 766. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS · AIR COMPRESSORS · ELECTRIC TOOLS · DIESEL ENGINES · ROCK DRILLS · HYDRAULIC TOOLS · VACUUM PUMPS · AVIATION ACCESSORIES

The first Watch with Illuminated Dial



The science of reckoning the hour was making great progress about the time that Columbus discovered America. For now, it was possible to tell the time at night—approximately, that is—and only on clear nights, and provided that you lived in the Northern Hemisphere. All you had to do was hold up the Nocturnal at arms length, sight the Pole Star through the center hole and line up the two pointer stars of the Big Dipper with the bottom of the arm on the Nocturnal. Then, if the moon were bright enough or you happened to have brought along a lighted lanthorn, you could look at the scale and read the time. This was wonderful but unimportant, because the pattern of man's days was still dictated by the number of daylight hours and would so continue for centuries. Today, at the drilling rig, daylight or dark make little difference. What counts is the drill bit. If you depend upon Truco Diamond Bits you get irresistible cutting power in any formation; swift, accurate, thrifty penetration that reduces rig time and pays off handsomely in cash savings. May we send you our Diamond Bit Catalog?

WHEEL TRUEING TOOL COMPANY
3200 W. Davison Avenue, Detroit 6, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

THESE REPOINTERS ARE
wear-conditioned

Because they are AMSCO "Wear-Sharp"* Repointers that stay sharper with use...

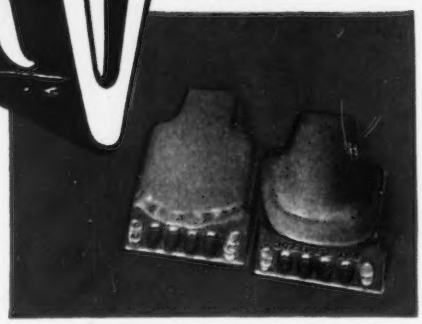
Service life plus! The combination of Amsco Manganese Steel and the hardness of AMSCOATING with Amsco Hardfacing electrodes—gives you a tooth that wears evenly and stays sharp longer.

Note that only certain grooves (shown in red at left) are Amscoated—the grooves on the outside and the one on each end. This is the area where ordinary teeth wear fastest. The hardened corners on the "Wear-Sharp" equalize wear along the entire cutting edge and eliminate rounded, blunted corners that cut digging speed and waste power.

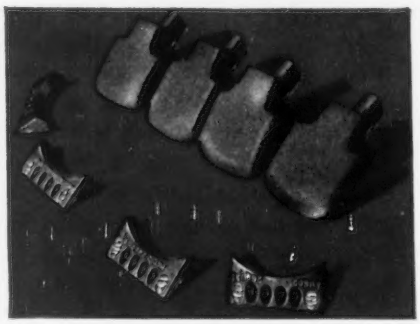
Field reports indicate that "Wear-Sharp" repointers will give as high as six times the life of other teeth.

In these photographs at right of a typical case history, old repointers lasted from three to four days. Amsco "Wear-Sharp" repointers lasted 32 days—eight times the service life of the repointers previously used.

* U. S. Pat. No. 2,247,202



"Wear-Sharp" repointers installed on two dipper teeth showing condition of old teeth.



Notice the even wear on these teeth after 257 hours of use with "Wear-Sharp" repointers used. New "Wear-Sharps" are ready for installation.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION

376 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

UNITED PRESS PHOTO

BUILDING WITH EXPLOSIVES

Hoover Dam is an outstanding example of the many large construction projects which Hercules explosives have helped to build. The use of explosives on such projects calls for thorough understanding of the rock formation, selection of the correct explosives to shoot the rock, and adequate facilities to supply explosives on schedule. Our Contractors Division has complete technical and cost data on the use of explosives in any type of construction. Hercules also has service facilities to help you in solving mining, quarrying, and petroleum problems involving explosives.

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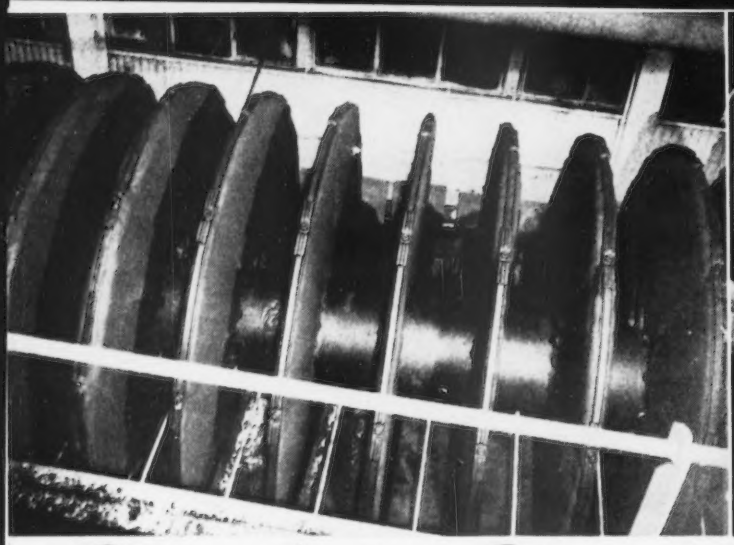
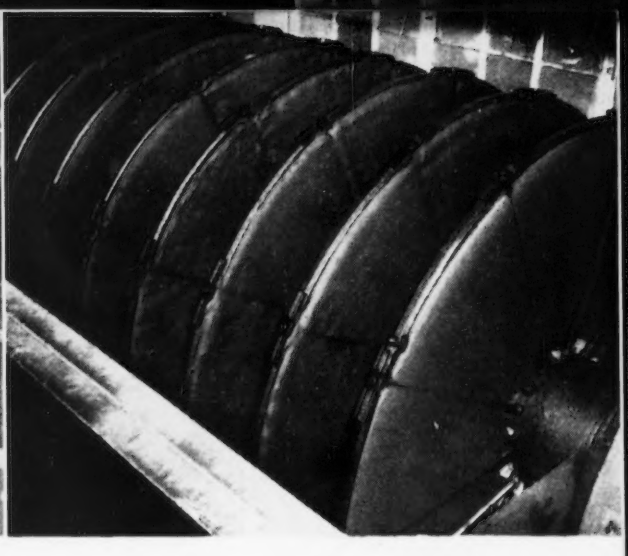
XR53-3





Eimco Agidisc Filters for Better Production on Fast Settling Slurries

Copper concentrates being fed to filters in one of the country's largest copper producing plants are being dewatered faster with lower cake moistures and in greater tonnages per square foot of filter area.

This is typical of Eimco designed and built equipment. While Eimco plants have built standard type disc filters dating back to the original disc type filters and many are still being sold for slurries that DO NOT have fast settling particles, Eimco was first again in developing a disc to handle slurries that DO have fast settling solids.

Eimco Agidisc Filters placed side by side with other disc type filters of standard design running on the same feed and under the same conditions show that Eimcos produce from 20% to 25% additional tonnage per sq. ft. of filter area with 1½% to 2% less moisture in the cake.

See Fig. 1 for sketch of section through Eimco Agidisc and Fig. 2 for sketch of section through an ordinary disc filter. Eimco Agidisc produces a smooth evenly distributed cake free of cracks and easily discharged so that bags remain free and give greater bag life with the removal of the abrasive action in settled solids in the bottom of the tank.

Eimco's more than half century of service to the process industries gives them the experience to design and build better filters to do a better job for you. Your inquiries on filtration problems will receive immediate and individual attention. Write today for more information.

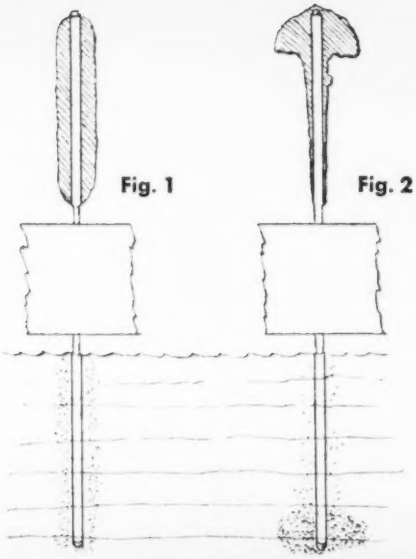
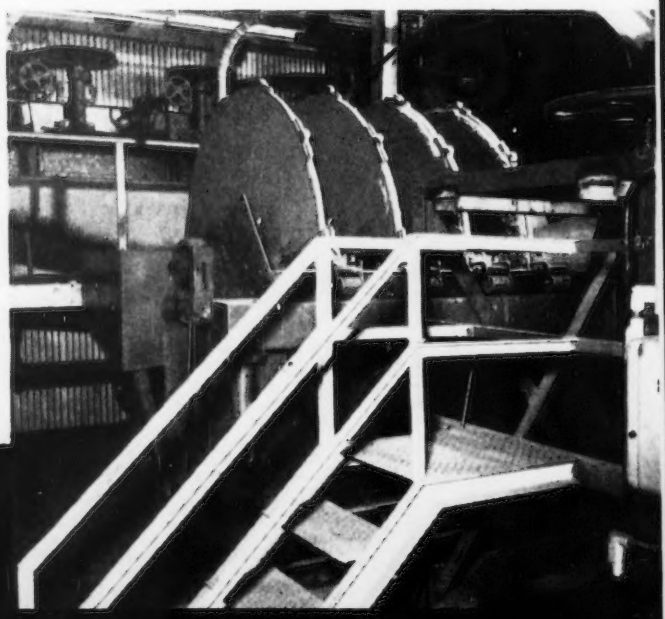


Fig. 1 Fig. 2



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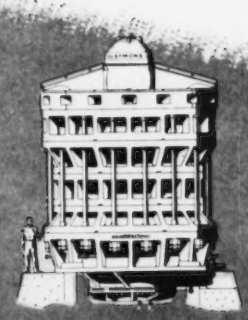
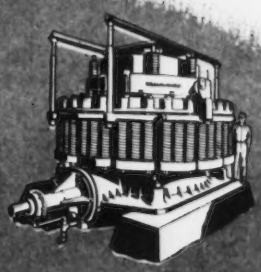
MAJOR PRODUCERS OF IRON ORE RELY ON NORDBERG MACHINERY

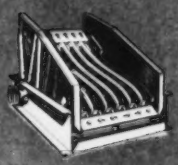


SYMONS PRIMARY GYRATORY CRUSHERS

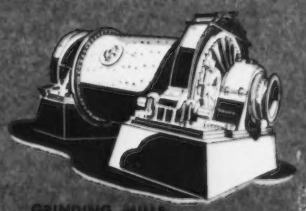


SYMONS CONE CRUSHERS

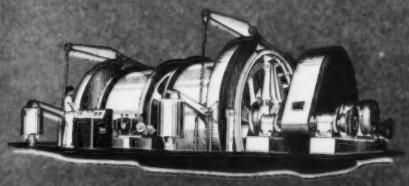
SYMONS VIBRATING SCREENS



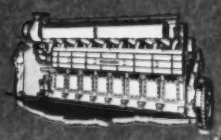
SYMONS VIBRATING GRIZZLIES



GRINDING MILLS



MINE HOISTS



DIESEL ENGINES

Partial List of Nordberg Machinery users among iron ore producers:

Alan Wood Mining Company
Appleby Frodingham Steel Co., Ltd.
Balkan Mining Company
Bethlehem Steel Company
S. K. F. Hofors Bruk
Brazilian National Steel Co.
Cleveland Cliffs Iron Company
Colorado Fuel & Iron Corporation
Colombia Iron Mining Co.
Consett Iron Co., Ltd.
Dominion Steel & Coal Corp.
Reserve Mining Co.
Grangesbergs Gem Forvaltning
M. A. Hanna Co.
Holman Cliffs Iron Mining Co.
Sandvikens Jernsverk
Jones & Laughlin Steel Corp.
Kaiser Company, Inc.
Luossavaara-Kirunavaara
Mesabi Cliffs Iron Mining Co.
Michipicoten Iron Mines, Ltd.
National Lead Company
Oliver Iron Mining Company
Ozark Ore Company
Pickands Mather & Company
Republic Steel Corporation
Sloss-Sheffield Steel & Iron Co.
A/S Sydvaranger
T.C.I. & R.R. Co.
Tata Iron & Steel Co.
A/S Titania
Warren Foundry & Pipe Corp.
Witkowitzer-Bergbau-u-Eisenhuttengew
Woodward Iron Company

IT is highly significant that so many of the world's iron mining companies are using Nordberg Mining Machinery. This dependable machinery is designed and built to meet the specific needs of the Mining Industry. Nordberg manufactures SYMONS® Gyratory Crushers for primary breaking; SYMONS Standard and Short Head Cone Crushers for fine reduction crushing; SYMONS Vibrating Grizzlies and Screens for scalping and sizing; Grinding Mills for wet or dry grinding; Mine Hoists; and a complete line of Nordberg Diesel Engines to meet practically any stationary power requirement.

Nordberg Mining Machinery assures years of maximum and continuous production at low operating and maintenance costs. Write today for literature on this machinery which will help you meet the needs of present day operating conditions.

NORDBERG MFG. CO., Milwaukee, Wisconsin

SYMONS . . . a registered Nordberg trademark known throughout the world

NORDBERG MACHINERY — NORDBERG — SYMONS SCREENS NORDBERG

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M253

AUTOMATION STARTS WITH WESTINGHOUSE MOTORS AND CONTROLS

How Westinghouse works with you to select motors and controls best suited for each job

Careful planning and proper application of motors and controls become even more important as more production processes become automatic. From 126 offices, Westinghouse offers you exactly this type of comprehensive planning and assistance in applying motors and controls.

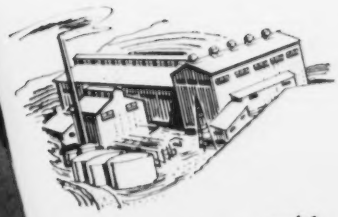
Qualified Westinghouse engineers will gladly work with you in studying your motor and control problems. They'll offer suggestions and, if you like, recommend equipment best suited for your needs. These engineers are specialists in various fields. In every industry, the knowledge and experience of a Westinghouse engineer will prove valuable. This assistance is available on local as well as national and international levels, making possible close cooperation and full understanding of your particular needs.

Thirty-seven strategically located Manufacturing and Repair Plants bring you local factory service. Fully equipped and expertly manned, they quickly handle any motor or control servicing need. Then, too, there are the well-stocked Westinghouse Warehouses, so located as to assure speedy delivery of genuine renewal parts.

Literature available—Considering the applications of motors and controls? Ask your local Westinghouse representative to give you *101 Case Histories of Life-Line* Motors,* booklet B-4769-A. Ask, too, for the complete-line booklets on Westinghouse controls, B-6051 and B-5882; or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-21745

*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse



The Cleveland-driven roll feeder shown here discharges ore to crushing rolls in the Arizona leaching plant of Inspiration Consolidated Copper Company. The first two of 45 Clevelands now operating were installed in 1923. WORM GEARING—universal in its application—affords advantages for almost every power transmission job.

CLEVELANDS drive feeders 30 years at Inspiration Copper

THIRTY years of uninterrupted service is an "event" for almost any speed reducer. But not for Cleveland. As one of many cases in point, take Cleveland's 30-year record at Inspiration Copper. Their first two Clevelands were installed back in 1923 to drive pan feeders. So well did they operate that over the years management added Clevelands for other applications—like this Cleveland-driven roll feeder at the company's leaching plant. Now, 45 Cleveland worm gear speed reducers are installed here—driving pan and drum feeders, trippers, revolving screens and belt conveyors.

Here are a few of the reasons for Cleveland's dependability:

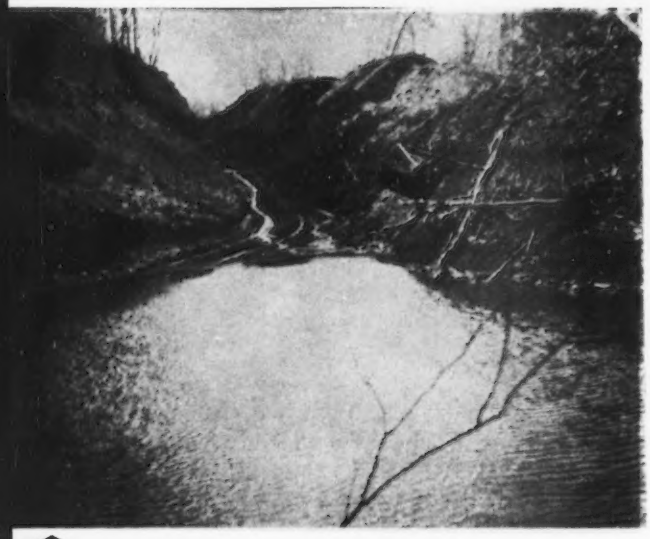
1. Cleveland case-hardened steel worms and nickel-bronze gears have up to 50% increased resistance to shock and wear.
2. Clevelands are designed and built to operate at uniform speeds. No unwanted fluctuations.
3. A minimum number of moving parts eliminates trouble.

Get more data—more help with your power transmission problems by writing today for new Catalog 400. The Cleveland Worm and Gear Company, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers

Replaces 7 trucks with 2 Tournarockers on tough coal stripping job



Portion of haul road, showing deep standing water . . . with soft, rutted incline in the distance. Hauling under these tough conditions, the 2 Tournarockers totaled 4,000 hours with 95% mechanical efficiency.

With heaped load, Tournarocker starts 300′ haul to fill. Rig's ability to turn 90° in 13′9″ radius speeds cycle. Says Owner Chapman: "One feature we particularly like about these machines is the way we can turn them around without stopping in our narrow cuts."

H. T. Chapman **of Elkins, West Virginia — stripping 1,500,000 yds. of shale for the Phil Williams Coal Co. near Elkins — has a serious haul problem on his hands. During much of the year working conditions are very bad. Steady rains, combined with poor drainage, continually saturate haul roads and material. At times, parts of the haul must be made through 30″ of water. Access roads are wet, spongy, and practically bottomless in places.**

"Only equipment that can do job"

When it became apparent that dump trucks couldn't work efficiently under these conditions, Chapman tried 2 rear-dump C Tournarockers. With their traction advantages—front-wheel drive, big high-flotation tires and power-proportioning differential (which automatically applies up to 4 times the power of slipping drive-wheel to wheel on firmer ground) — these rigs really did the trick! After several months' use Chapman observed, "Tournarockers are the only pieces of equipment that could do the job. My 2 'C's' have replaced 7 trucks!"

Move 220 yds. of overburden hourly

Company records covering several typical months of stripping show the 2 Tournarockers average 11 cu. yds. (almost 15 tons) of hard blue shale per load. On a soupy 600′ cycle, each rig makes 10 trips per hour . . . hauls 1100 yds. (1500 tons) per 10-hour day.

Also haul coal, 22 yds. per load

The 2 "C's" have also been used to haul coal. On this work, they move about 22 cu. yds. per load. Average 12,000′ cycles are completed every 15 to 20 minutes — in spite of travel through 800′ of belly-deep mud, up 700′ of 16% unfavorable grade and down 200′ of 30% favorable grade. That's 3 to 4 trips (66 to 88 cu. yds.) per hour for each rig.

Whenever *you* have coal, rock, ore, or other shovel material to haul, it will pay you to check the output of fast rear-dump Tournarockers. Write for complete facts and figures on work like yours. We'll be glad to arrange a demonstration for you at your convenience.

LeTourneau - Westinghouse Company

PEORIA, ILLINOIS

Tournarocker is shovel-loaded with 11 yds. (15 tons) of well-blasted shale. About 10% of chunks are too big to clear 2-yd. bucket. Note restricted loading area. Rig's low, wide, open bowl makes easy shovel target . . . speeds loading, boosts daily output.

At fill, Operator Dayley Collett backs Tournarocker to edge of bank, flips fingertip "dump" button, drops load clean over bank. Reports Collett, "What I like most is the easy way these Tournarockers handle. They turn around with plenty of room to spare."

Tournarocker—Trademark Reg. U. S. Pat. Off. R-221-CM

more and more MANITOWOCS on more and more stripping operations

Peter Kiewit & Son move in big MANITOWOC 4500 to strip Fortune Lake Development

Another big stripping job, and another big Manitowoc takes over. The Fortune Lake open pit mine, in Northern Michigan, owned by Pickands Mather & Co., is being stripped by veteran contractor Peter Kiewit & Son of Omaha, Nebraska.

Kiewit knows earth-moving and knows his equipment too. On the job went a 5 yd. Manitowoc Dragline to handle the difficult assignment. The Manitowoc 4500 had proved its mettle many times previously — proved its ability to lick tough jobs, profitably — so it was only natural to have a 4500 break ground.

Whether it's ore or coal, mining or stripping, you too will find a Manitowoc the most profitable investment you can possibly make. Included in the Manitowoc line are special hi-lift shovels, long reach draglines, designed for mining and stripping. May we send you complete information? Manitowoc Engineering Corporation, Manitowoc, Wisconsin.

MANITOWOC Speed Crane

SHOVELS 1-5 YD. CRANES 18-100 TON

an ACCO product

LAY-SET Preformed WIRE ROPE

SPECIFY... HAZARD ...the GREEN Strand Brand

Here's something your best friend will tell you— that he gets better service from HAZARD "Green Strand" Wire Rope

There's a Mighty Good Reason!

● Sure, HAZARD is made to standard specifications but there is one thing that tells you the moment you look at it that it's the best wire rope made—and that's the GREEN STRAND.

It will cost you more in the long run if you just order wire rope—where you can get it the cheapest. Just like anything else, the experience and integrity of the manufacturer are the real reason why you get longer service and better value from HAZARD Green Strand.

HAZARD Green Strand is made from the best materials, with precision, by oldtimers in the wire rope business. Then only certain constructions, carefully checked in use, are recommended for specific jobs you do. It's this combination of quality wire rope and correct recommendations that saves you money on all your wire rope purchases.

● Don't just ask for wire rope—specify, *and get*, HAZARD Green Strand Preformed Wire Rope. See your local HAZARD distributor or write our Wilkes-Barre office today for recommendations covering the equipment you operate.

makers of ACCO Registered WIRE ROPE SLINGS

ACCO

TRADE MARK

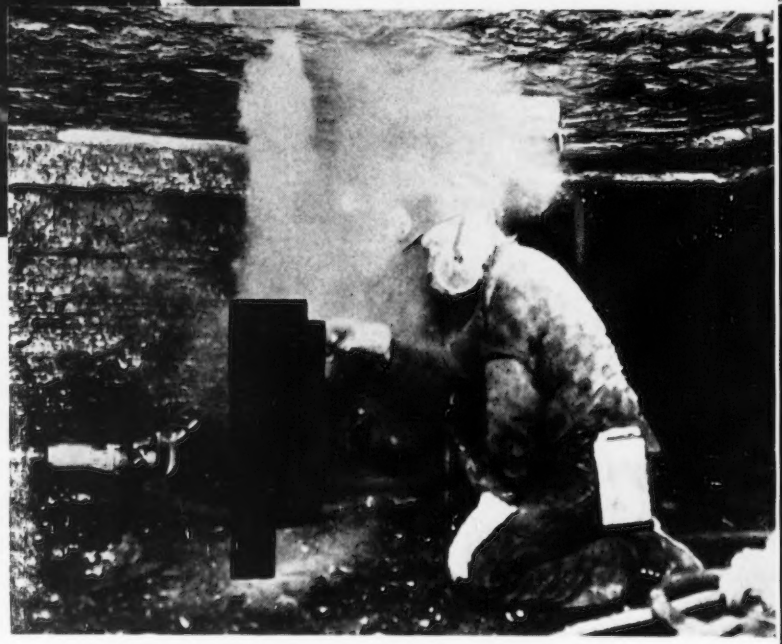
HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex.
Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Roof Bolting DUSTFREE

◄ Drilling a hole in a roof with the Holman DRYDUCTOR. No dust! No chippings! No sludge! (Only machine exhaust.)

The old method — dry rock drill drilling a hole in a roof, clouds of dust being emitted. The ▼ machine has been obliterated.



The Holman DRYDUCTOR is the world's only *dust-free* dry rock drill. A successful, practical solution to the problem of drilling without the use of water, it removes the dust *as it is made*, passes it through the hollow drill steel and out through the rear of the machine.

N.B. **The DRYDUCTOR** *cannot* release dust while it is drilling, and it cannot drill *unless* the dust is being removed.

In the United States, the development of the Holman DRYDUCTOR is being handled by The Goodman Manufacturing Company, Halsted Street and 48th Place, Chicago, Illinois, to whom all enquiries should be addressed.

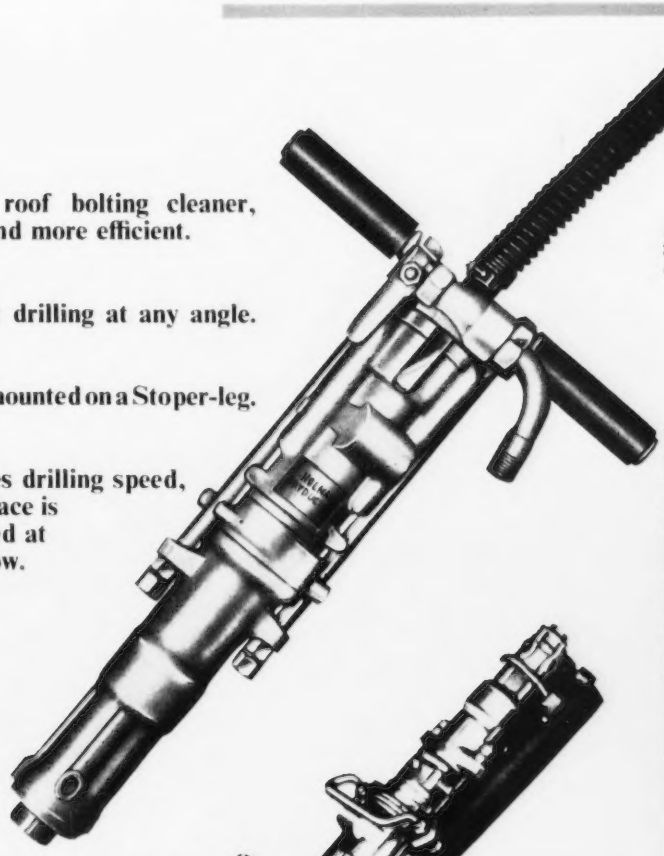
In Canada please refer to:—
Holman Bros. (Canada) Ltd.,
Kent Avenue,
Kitchener,
Ontario.

In Australia please refer to:—
Holman Bros. (Aust.) Pty. Ltd.,
Collins House,
Collins Street,
Melbourne, C.1.

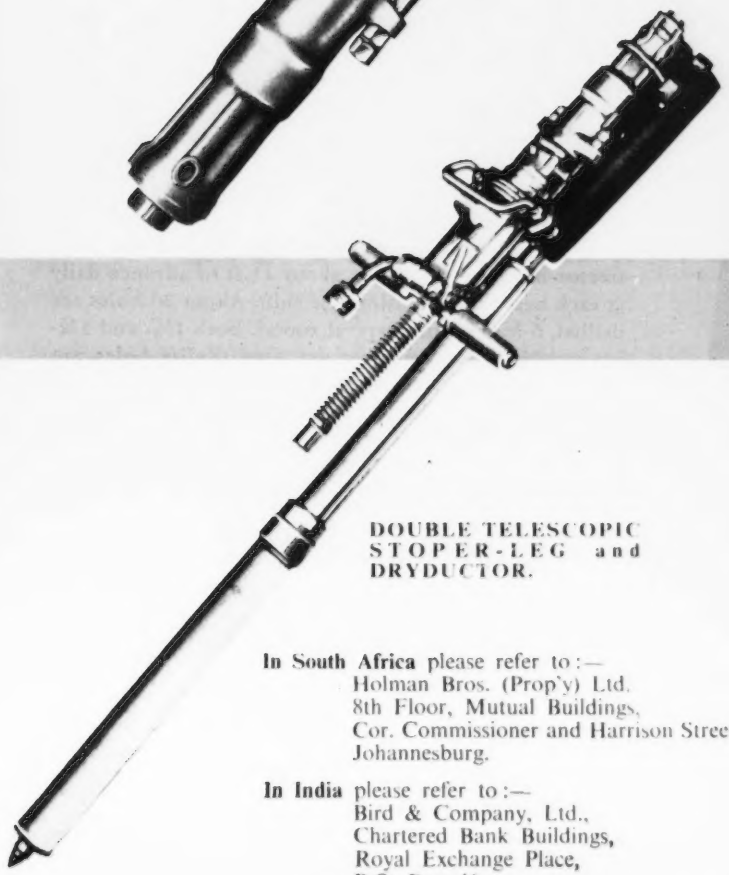
TELEPHONE: CAMBORNE 2275 (9 lines) SUBSIDIARY COMPANIES. BRANCHES

-with the Holman DRYDUCTOR

- Makes roof bolting cleaner, easier and more efficient.
- Efficient drilling at any angle.
- Can be mounted on a Stoper-leg.
- Increases drilling speed, as new face is presented at each blow.



A DRYDUCTOR. Bore 2¼". Stroke 2¼". Length 26". Weight 61½ lb.



DOUBLE TELESCOPIC STOPER-LEG and DRYDUCTOR.

Photographs by kind permission of Dominion Steel and Coal Corporation, Sydney, Nova Scotia.

▲ *Holman Dryductor driving roof bolt into place, using a driving head in the chuck of the drill.*

▼ *Raising with the Holman Dryductor.*

In South Africa please refer to:—
Holman Bros. (Prop'y) Ltd.
8th Floor, Mutual Buildings,
Cor. Commissioner and Harrison Street,
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In India please refer to:—
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Chartered Bank Buildings,
Royal Exchange Place,
P.O. Box 46,
Calcutta.

Holman

AND AGENCIES THROUGHOUT THE WORLD TELEGRAMS: AIRDRILL, CAMBORNE

Blasted rock is hoisted up the shaft in dump cars which are emptied into trucks for disposal. This contract is a part of Philadelphia's sewer improvement program.

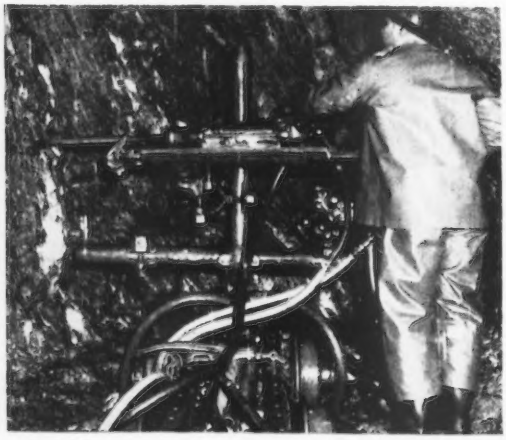
Battling hard rock and underground water in 4200-ft Philadelphia sewer tunnel

Dominic J. Lombardi (center) talks drill steel and bits with J. A. Klemeyer (left) and Wayne D. Burnside (right) of Brunner & Lay Rock Bit Corp. The bit shown is a 4-in. Rok-Bit with cutting edges of tungsten carbide; it's attached by means of an adapter to a 1¼-in. rod of Bethlehem Hollow.

Hard, abrasive rock is usually trouble enough for a tunnel-driving contract, but Joseph Lombardi & Sons also had to contend with heavy flows of underground water in driving a 6-ft diameter tunnel for the City of Philadelphia. The $588,000 contract calls for some 4200 ft of 6-ft tunnel.

Drilling, blasting, and mucking is carried on at several headings served by two shafts from the surface. Using jumbos which mount two 3½-in. drifters, the contractor has been averaging about 11 ft of advance daily at each heading, operating one shift. About 20 holes are drilled, 6-ft deep, in a typical round. Both 1⅝- and 1¾-in. carbide-insert type bits are used. Relief holes are drilled with 4-in. bits, attached by means of a bit adapter on 1¼-in. rods of Bethlehem hollow drill steel.

Lombardi expects to drill a total of about 75,000 ft of hole before the tunnel is completed. The rock has been mostly Baltimore Gneiss, known locally as Burholme Granite. In any case, the drilling crews can testify that it's both hard and abrasive.



Slickers and boots are regulation in the tunnel because of the constant "rain" and seepage which sometimes floods the tunnel, halting operations until the pumps can bail it out. This special jumbo, mounting two drifters, puts in about 20 holes of 6-ft depth each round.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

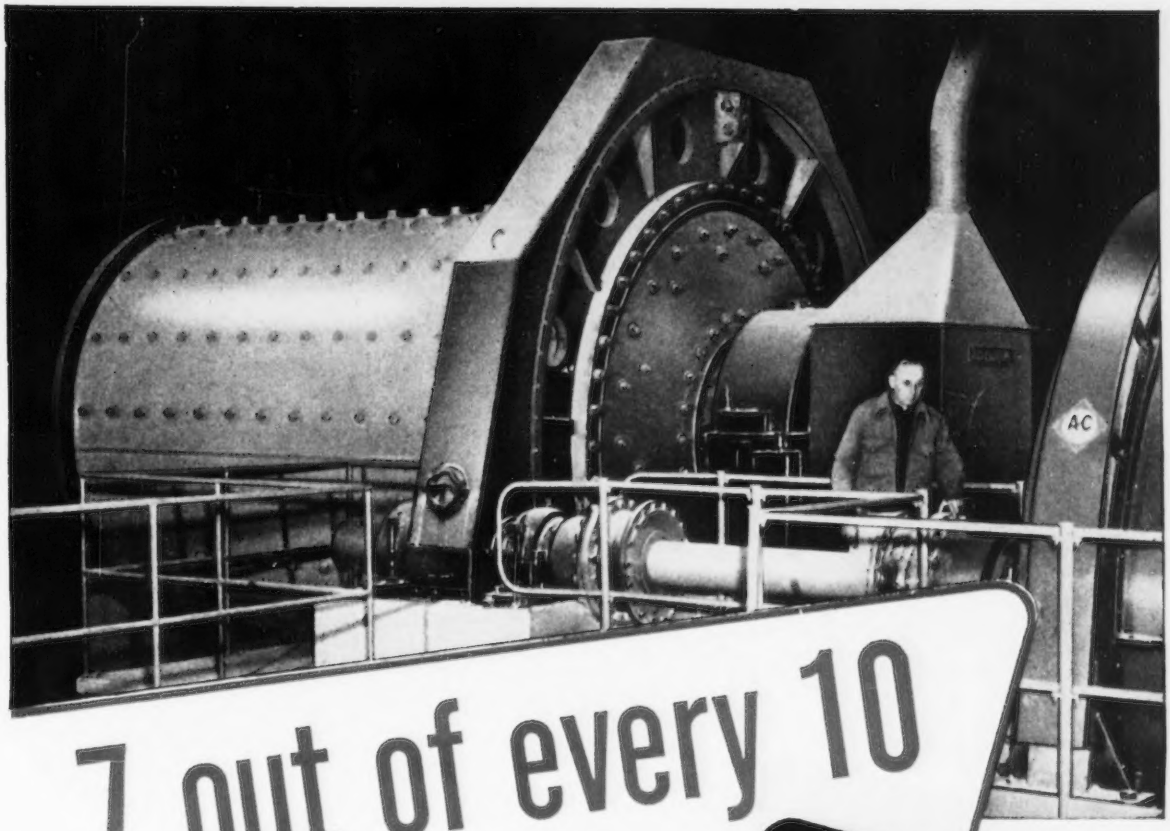
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

TWO GRADES OF

BETHLEHEM HOLLOW DRILL STEEL

- *The "Old Reliable" carbon type*
- *Ultra-Alloy, our chrome-moly grade*

BETHLEHEM STEEL



7 out of every 10

are repeat orders

ALLIS-CHALMERS GRINDING MILLS

OPERATING MEN who have had actual experience with Allis-Chalmers grinding mills will usually specify A-C mills again... as proved by our sales records.

Repeat orders, of course, come only from customers who have been well satisfied. That's why we're proud of the fact that 7 out of 10 new Allis-Chalmers grinding mills go to operators for whom we have supplied mills in the past.

Ask the Allis-Chalmers representative in your area about the many high output and low maintenance advantages of Allis-Chalmers grinding mills. Or write for Grinding Mill Bulletin 07B6718A. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3845

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A-C ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Hammermills

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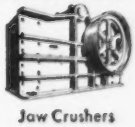
Jaw Crushers

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"Here's one place where it pays to be TIGHT!

"Shooting a blast is like jumping with a parachute . . . everything's got to work right the first time, or else!

"And everything depends on the loading and hook-up. You need *tight* connections all along the line, and you get 'em quickly and easily with Primacord.

"For the trunk line, I use Plain Primacord. It ties easily in knots that don't loosen up.

"That square knot is used above ground, when you want to lengthen the trunk line.

"Just remember to *pull it up tight*. You can, with Primacord."

Ask your explosives supplier or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut
Also Safety Fuse Since 1836

PLAIN PRIMACORD

is very flexible and light in weight. It has a tough textile cover and can be tied up tight without slipping. Use it as the down line in small bore or shallow holes and as the trunk line to connect all holes.

Other PRIMACORD Brands

Reinforced — for deep holes and resistance to abrasion

Wire Countered — for deep ragged holes

Plastic Reinforced — for deep holes and unusual wet conditions.

P-2

Use PRIMACORD®

The PROVED and APPROVED DETONATING FUSE

S-A

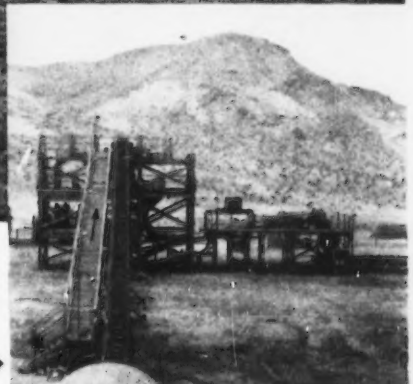
CONVEYING *System* carries MANGANESE ORE through processing to storage

From the desert land of southern Nevada manganese oxide flows to the American steel industry—via S-A conveyors. The cost of working these domestic deposits is high. With this in mind, S-A engineers designed a conveying system low in initial cost—high in performance for the estimated life of the project.

With a background of over fifty years of experience in the mining industry, S-A engineers have become familiar with its particular problems. Every S-A designed system is both mechanically and economically right!

Depletion, price fluctuation and rugged operating conditions are just a few of the multiple considerations that precede an S-A job recommendation. You assume no obligation when you call on your nearest S-A representative for his "made to measure" solution to your conveyor problems.

General view of storage conveyor. Stacking boom can be raised or lowered to suit height of storage pile and prevent degradation.



S-A Pan Conveyor carries hot nodulized ore from calcining kiln to sampling station.

MANGANESE INC.
Henderson, Nevada

Rough ore travels by S-A Belt Conveyor to storage. It is reclaimed for processing and discharged from the concentrator plant as filter cake. A 24" belt conveyor carries the filter cake on a 256 foot slope run to the pug mills for blending. After discharge to kilns which nodulize the concentrate, the hot concentrate moves by pan conveyor to a sampling station. It is then fed to an 18" belt conveyor, 346 feet long. A traveling tripper with a 45-foot stacking boom piles it for storage.

Belt Conveyors	Conveyor Belt Cleaners
Belt, Pan & Plate Feeders	Headshaft Holdbacks
Ship Loading Boom Conveyors	Grizzlies & Screens
Stacking Conveyors	Centrifugal Pilers
Storage & Reclaiming Systems	Bin Gates & Tunnel Gates
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REDLER Conveyor-Elevators	Skip Hoists
ZIPPER Conveyor-Elevators	SEALMASTER Ball Bearing Units

Write for a bulletin on any of the above

STEPHEN S-A ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

this costs money

Underloaded conveyors cost you money because they are not utilized to capacity . . . you're not getting full return on your investment . . . subsequent operations are starved for materials.

this wastes money

Overloaded conveyors cause unnecessary cleanup . . . thus waste labor. Subsequent operations are periodically flooded with more material than they can handle.

this saves money!

A properly loaded conveyor, with flow to it regulated by a Rex® Feeder, is economical and efficient . . . promotes smoothness and economy throughout entire processing operation.

YOU save time, material, money with CHAIN BELT REX COMPANY® apron feeders!

Uniform, Regulated Flow . . . that's important when you're concerned with moving bulk materials from bin or hopper to belt conveyor or crusher. With Rex Feeders you're assured a metered, uniform rate of transfer, regardless of variation in size of material handled. Your belt conveyor or crusher will receive a steady flow of material to assure smooth, efficient, low-cost operation.

Ask your Rex Field Sales Engineer to give you complete information on how you can save money with Rex Feeders. Call the office nearest you, or write to Chain Belt Company, 4679 W. Greenfield Ave., Milwaukee 1, Wis.

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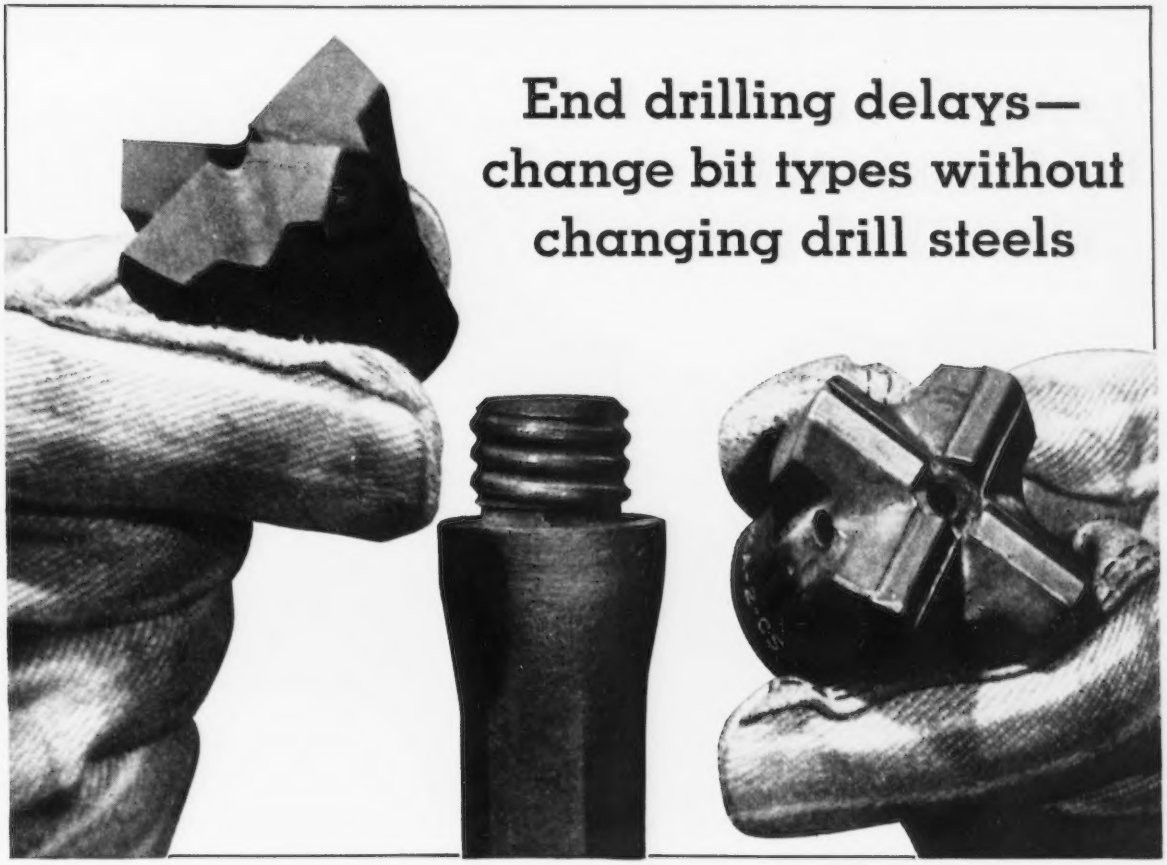


End drilling delays—change bit types without changing drill steels

93 Timken® multi-use and carbide insert bits fit the same steel!

YOU can quickly switch from one bit type to another, and always be sure of using the most economical bit for the ground, when you use Timken® rock bits. That's because as many as 93 different Timken multi-use and carbide insert bits are interchangeable on the *same* drill steel.

The switch is made in minutes. The driller simply unscrews one type of Timken bit and screws the other type on the same drill steel. No time wasted switching steels. No need to stock expensive double inventories of drill steels.

Both Timken multi-use and carbide insert bits give you two important advantages: 1) made from electric furnace Timken alloy steel, 2) special shoulder union keeps drilling impact from damaging the threads.

Our rock bit engineers stand ready to help you with your drilling problems. They're experts in keeping drilling costs to a minimum. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE TIMKEN MULTI-USE BITS CUT COSTS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest costs per foot of hole when full increments of steel can be drilled.

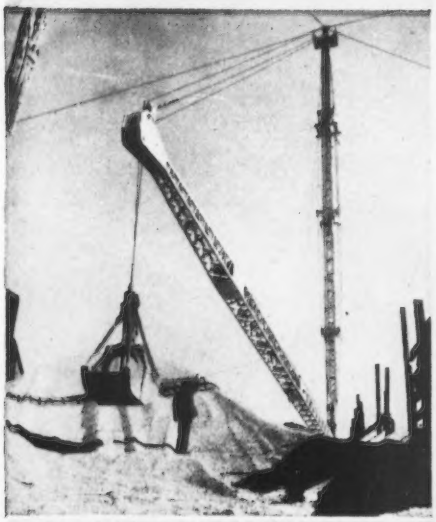
WHERE TIMKEN CARBIDE INSERT BITS CUT COSTS

Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small-diameter holes, very deep holes.

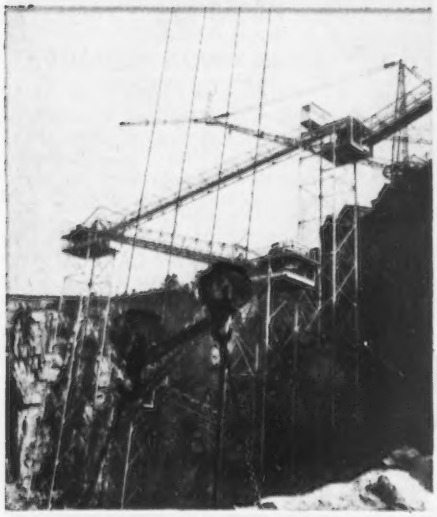
TIMKEN

...your best bet for the best bit...for <u>every</u> job

At this granite quarry..

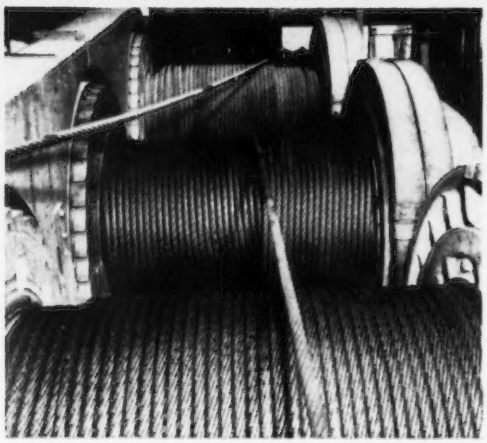


TINY PARTICLES OF GRANITE DUST are constantly grinding away the wire ropes on this Storage Derrick. But ¾" Tiger Brand Ropes have averaged many years of good service in spite of this severe abrasive action.



SAFE AND SOUND after years of continuous service. That is the amazing record of the ¾" Tiger Brand Ropes on this cableway, which is used to move workers in and out of the quarry.

THE WESTON & BROOKER COMPANY likes Tiger Brand Wire Ropes because they meet the stiff operating requirements and do every job economically.



Tiger Brand Wire Ropes have been used 29 years!

DOWN AND DOWN YOU GO! It takes 10 minutes to travel the 220 ft. from rim to floor of Weston & Brooker Company's huge granite quarry at Cayce, South Carolina. The 1" Tiger Brand Wire Ropes on this derrick have handled loaded concrete trucks, power shovels, and other heavy equipment for 5 years, and the ropes are still in good operating condition.

PLUNGING 220 ft. down through solid granite, this big open quarry is one of the deepest in the country. But no roads wind down to the floor, so The Weston & Brooker Company must transport all men and equipment with cableways and derricks.

This old, experienced company prefers American Tiger Brand Wire Ropes for this equipment over any other brand. Tiger Brand Ropes meet the tough operating requirements and give remarkable service.

On a cableway, which was installed in 1924, Tiger Brand Ropes have given long and phenomenal service.

On a big 70-ton stiff-leg derrick, which lifts shovels, trucks and other equipment weighing up to 80 tons, Tiger Brand Ropes are still in use after five years of hard service.

On a revolving storage crane, which operates right in the thick of hard, abrasive granite dust, Tiger Brand Wire Ropes again have given exceptional service.

Tiger Brand Wire Ropes will give *you* exceptionally long, low-cost service too. Send the coupon for a run-down on the hundreds of sizes and types available and typical jobs that each rope can do.

HELPFUL GUIDE BOOK

American Steel & Wire
812 Rockefeller Building
Cleveland 13, Ohio

Please send me, without obligation, a copy of your booklet, "The Right Rope for the Job," which lists the correct Tiger Brand Rope to use for hundreds of typical applications.

Name_____

Company_____

Address_____

City & State_____

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COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL

IDENTIFICATION DISC: An aluminum marking plate on all Walworth No. 225P's facilitates inventory control and makes reordering quick and positive.

take a good look at the Walworth "500 Brinell" no. 225P Globe

NEWLY DESIGNED HANDWHEEL: Patented air-cooled, finger-fit handwheel affords sure grip even with greasy gloves.

– the Toughest Bronze Valve Your Money Can Buy

The stainless steel, corrosion resistant seats and discs are heat treated to a hardness of 500 Brinell – hard enough to scratch glass and crush nails! The valve can be closed on sand, slag, and pipe scale without injury to the seating surfaces. "Wire drawing" is practically eliminated. All parts are accurately machined and gaged. Years of tight, positive shut-off are assured.

Available in both globe and angle types (angle type: No. **227P**) in sizes ¼" to 2", this quality valve is recommended for 350 lbs. W.S.P. at 550 F, and 1000 lbs. non-shock service on cold water, oil, gas, or air.

For full data on this long-life, economical Walworth Bronze Valve, see your local Walworth distributor, or write for Circular.

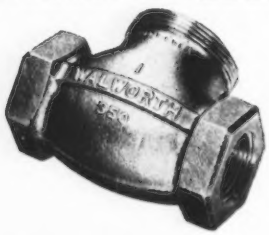
IMPROVED PACKING: Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure when fully opened.

note these 7 Great Features

HEXAGONAL UNION BONNET CONNECTION, DEEP STUFFING BOX AND RUGGED STUFFING NUT: Union bonnet connection eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and reassembled.

OVERSIZE STEM: The high-tensile strength silicon-bronze stem assures long life and protection against wear.

SEATS AND DISCS: Plug type seats and discs of stainless steel, heat-treated to 500 Brinell hardness and machined simultaneously to a mirror-like finish, with accurate tapers assures tight positive shut-off with minimum handwheel effort.



EXTRA STRONG BODY: Made of Composition M (ASTM B61) bronze. Thick walls and rugged hexes provide a high safety factor. Valves undergo hydrostatic shell test of 1,000 psi.

WALWORTH

valves and fittings

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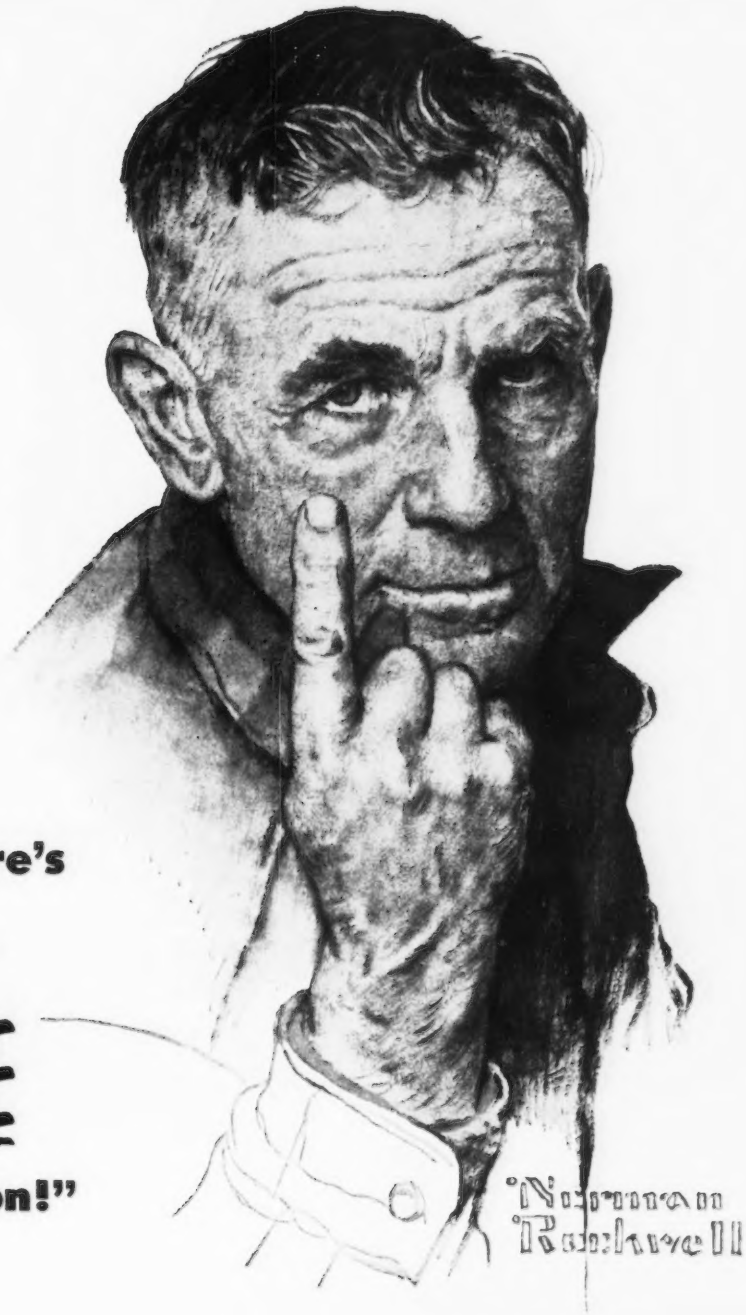


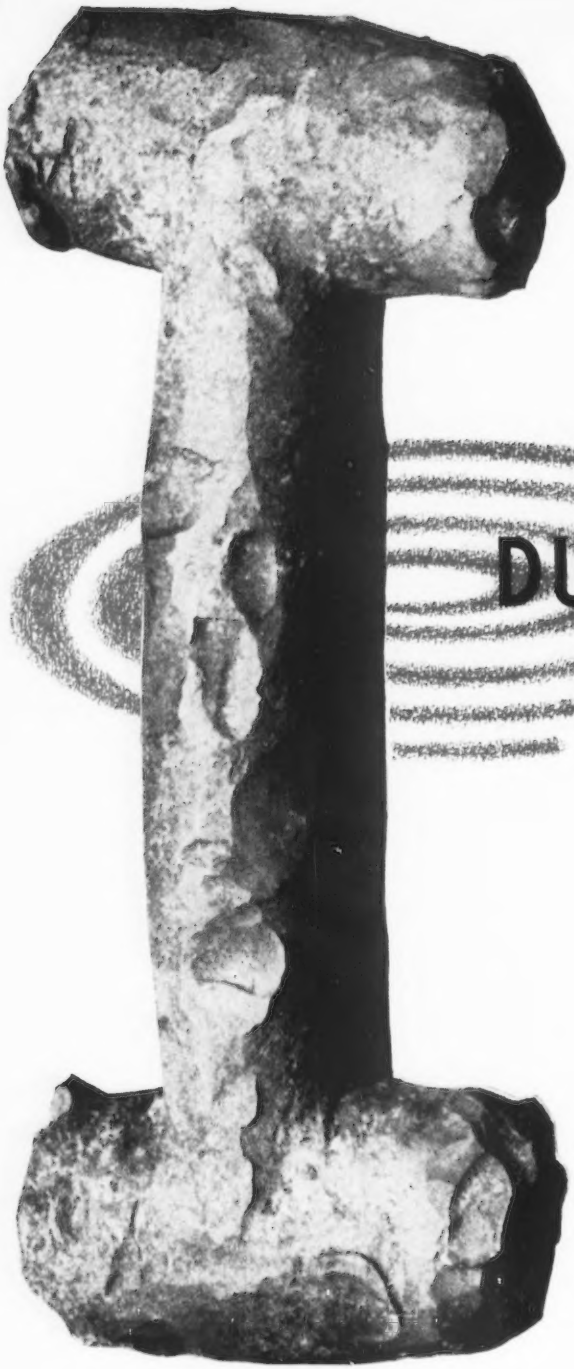
IT'S JUST THAT SIMPLE. There's only one reason in the world why so many wire rope users in the mining field prefer Roebling wire rope... *it costs a lot less on the job than any other.*

For maximum wire rope efficiency and economy, call your nearest Roebling office for a Field Man. He'll recommend the best ropes for your requirements.

ROEBLING

A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.



ACTUAL SIZE

DUMB-BELL?...

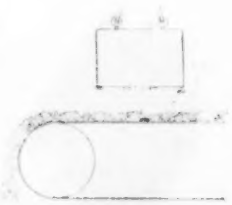
. . . NO,

it's a big 8-inch hunk of iron that found its way into a crusher. Its scarred surface tells a sad story about that crusher and its unhappy owners who learned how economical an investment a magnet can be . . . the hard way.

Preparation plants that don't magnetically protect their crushers, belts and other equipment ought to compare the cost of tramp iron trouble with that of adequate magnetic protection.

And if your old magnets aren't doing the job, learn about the new, improved types available. *Write Dings today for* CATALOG C-5000-B.

Dings Magnetic pulley installed as head drive pulley on conveyor belt. Iron separated, discharged automatically.



Dings Rectangular Suspended Magnets pull iron out of deepest burdens, fastest moving conveyor belts.

RS153

Dings

MAGNETIC SEPARATOR COMPANY

4716 W. Electric Ave., Milwaukee 46, Wisconsin

Magnetic Separation Leader for over Fifty Years

MINING MACHINE CABLE

. . . AND WHY THERE'S MUCH MORE TOUGHNESS IN ANACONDA'S NEW MINING MACHINE CABLE

Your naked eye can't spot diameter differences in new cables. That's why it's important to check promptly when you *do* see variations in cable after it's been used. It has probably been crushed . . . by runovers or rib-pinching. Compression cuts may let in moisture *to shorten cable life.*

HOW TOUGH SHOULD CABLE BE?

As tough as we can make it—regardless of cost. One break in a cheap cable costs more than you can save by buying on price. The new ANACONDA Cables mean lower costs to you because they can take much more abuse. In fifteen mines recently surveyed, the average life of ANACONDA Cables on shuttle cars jumped 300% over cables used only a few years ago.

WHY THE NEW ANACONDA CABLES LAST LONGER

A stronger jacket, made from a new neoprene compound, resists heat, flame and moisture better. In wet mines, sliver-cuts that may cause shocks are less likely to occur. A new cold-rubber insulation means new toughness. Moisture-wise and puncture-wise both. A new type of stranding improves the flexibility of these cables under stress.

YOU BE THE JUDGE

Examine an ANACONDA Cable. See why these things are so. Call your nearest Anaconda Sales Office or Distributor for a sample. And remember: no ANACONDA Cable has ever failed a U. S. Bureau of Mines flame-test. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

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TODAY'S HEADQUARTERS FOR MINE CABLE

FLAT-TWIN CABLES FOR:
shuttle cars
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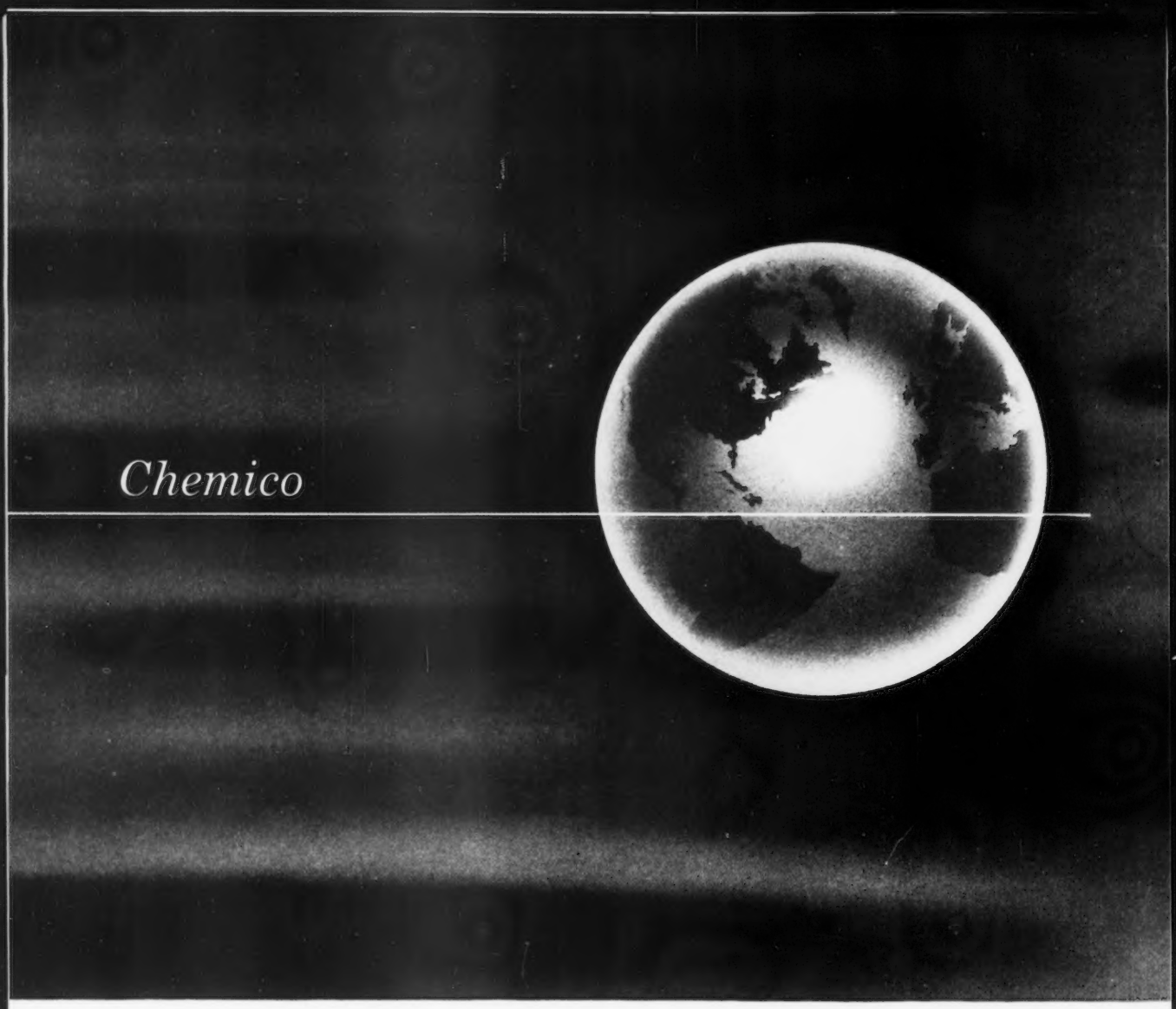
TYPE SH-D FOR:
shovels

TYPE SO FOR:
hand drills
remote control

TROLLEY WIRE
FEEDER CABLES
TELEPHONE WIRE
SHOT FIRE CORD
WELDING CABLES



"a world of achievement in a word"

It has been said that achievement is the measure of progress. Let's look at Chemico's record.

Since 1914 Chemico has been responsible for more than 900 installations in practically every far-flung corner of the earth, to say nothing of its wide scale projects at home. Ammonia and nitrogenous fertilizer for India, Mexico, Egypt and the Philippines; sulfuric acid for Canada, England, Formosa, Brazil and South Africa; urea for Japan; waste acid recovery for Iran, to name a few.

Thirty-nine years of satisfactory service to its clients has earned Chemico a proud record of achievement.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST, NEW YORK

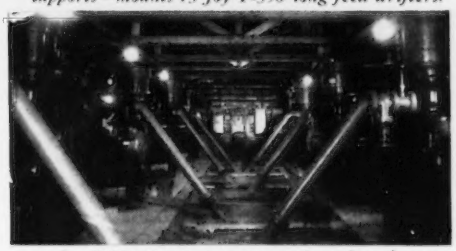
TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICAN CYANAMID (PTY) LTD., JOHANNESBURG

Chemico plants are profitable investments

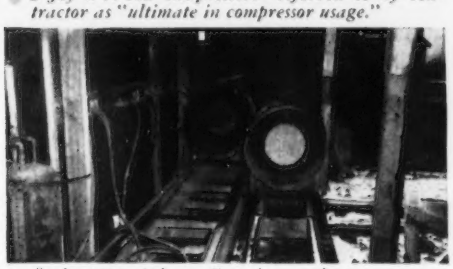
Full heading after both top heading and bench have been excavated. Excavated dia.—51 ft.

Main Jumbo for driving top heading—mounts 17 T-350 long-feed drifters on Joy Hydro Drill Jibs.

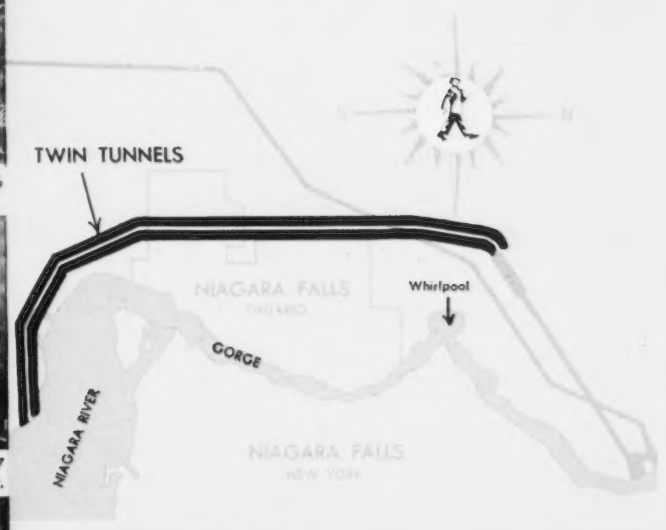
Jumbo for bench drilling—suspended from roof supports—mounts 13 Joy T-350 long feed drifters.



8 Joy WN-102 compressors—referred to by contractor as "ultimate in compressor usage."



Series 1000 Axivane Fans in ventilation arrangement. Tracks permit adding fans as desired.



PROGRESS REPORT ON THE WORLD'S LARGEST TUNNEL

SIZE: Twin Tunnels 51′ Dia., 5½ mi. length.

LOCATION: Niagara Falls, Ontario.

EQUIPMENT USED: (All Joy Installation):
114 T-350 Drifters on LW-6A Feeds on Hydro Drill Jibs.
24 WN-102 Semi-Portable Air Compressors.
Series 1000 Axivane Fans—added as needed to maintain air volume.

The world's largest tunnel is being bored out of *solid rock* with the help of Joy rock-drilling equipment, ventilating fans and air compressors.

4,375,000 cu. yds. (9,923,000 tons) of rock will be excavated to form the huge twin tunnels. These 5½ mile tunnels will convey water from the upper Niagara River beneath the city of Niagara Falls, Ontario, to a point near the Whirlpool Rapids, well below the Falls. Water thus diverted for hydro-electric power purposes would supply the water needs of 200 million people!

This is the first large tunnel operation where drilling has been mechanized. The "All Joy Equipment" installation confirms Joy's position as leader in the heavy construction and tunneling equipment market. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

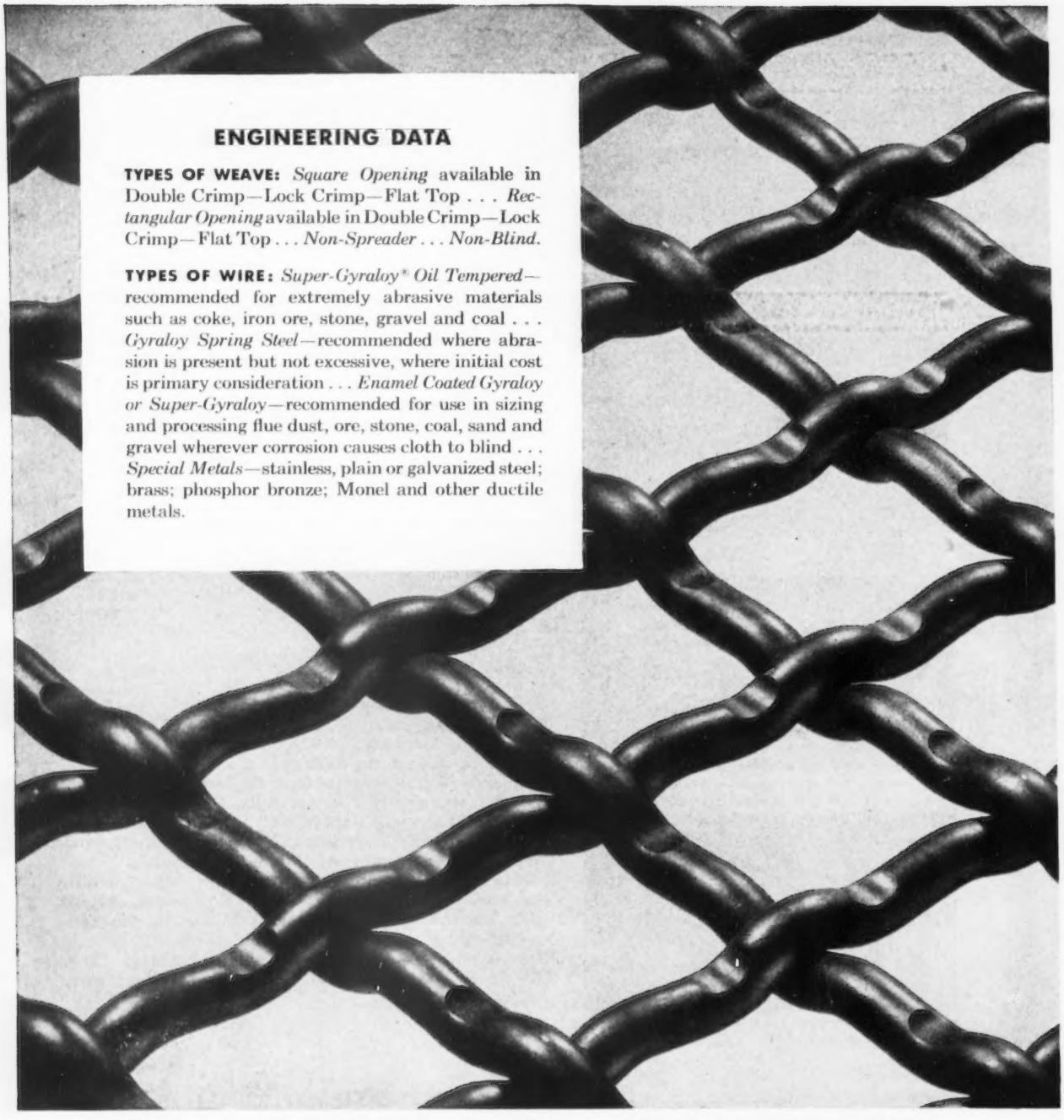
Consult a Joy Engineer

W&D C-4537

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

We'll Give You Better



ENGINEERING DATA

TYPES OF WEAVE: *Square Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Rectangular Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Non-Spreader* . . . *Non-Blind.*

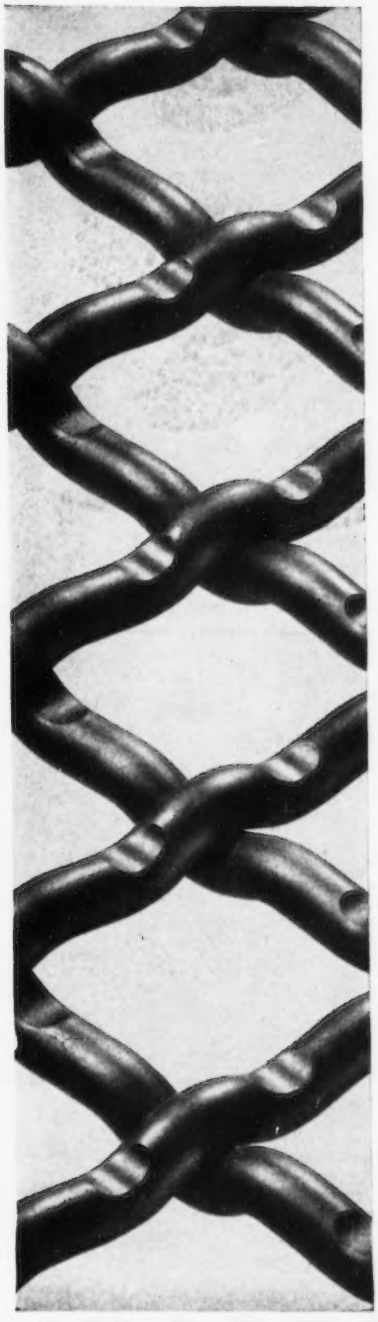
TYPES OF WIRE: *Super-Gyraloy® Oil Tempered*—recommended for extremely abrasive materials such as coke, iron ore, stone, gravel and coal . . . *Gyraloy Spring Steel*—recommended where abrasion is present but not excessive, where initial cost is primary consideration . . . *Enamel Coated Gyraloy or Super-Gyraloy*—recommended for use in sizing and processing flue dust, ore, stone, coal, sand and gravel wherever corrosion causes cloth to blind . . . *Special Metals*—stainless, plain or galvanized steel; brass; phosphor bronze; Monel and other ductile metals.

HEWITT-ROBINS INCORPORATED

HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

Screen Cloth Delivery



Increased Production Capacity Assures Faster Delivery For All Types Of Hewitt-Robins Screen Cloth

Now, we can give you faster delivery—*direct from our own modern plant*—of the finest quality screen cloth to meet your every need . . . Screen Cloth that gives you longer life, greater satisfaction on any type of screen, regardless of make . . . Screen Cloth that will provide you with highest efficiency, lowest cost per ton.

For shorter delivery on any type of Hewitt-Robins screen cloth send us this information:

1. Type of screen—Name of manufacturer—Model of machine.

2. Kind of screen cloth desired: Specify type *weave*—type of *wire*.

3. Size of clear opening or mesh and wire diameter.

4. Type of edge formation: Flat edges — Welded — Reinforced hook strips.

5. Length and width of panels (width measured from outside to outside of bent hooks)—Height and length of hook strips—Degree of angle inside of hook.

6. For rectangular, non-spreader or non-blind openings: Specify direction of long slot (which dimension of cloth it parallels).

7. For dewatering decks: Size of openings in mm—Single, double or no depressions—Round or triangular profile stainless steel rods.

WRITE FOR SCREEN CLOTH BULLETIN No. 113-A1

CHECK FOR INFORMATION ABOUT THESE JOB-TESTED PRODUCTS FOR YOUR OPERATION

CONVEYORS:
- ☐ —Belt
- ☐ —Dock
- ☐ —Ore Mine
- ☐ —Shuttle
- ☐ —Slope
- ☐ —Vibrating
- ☐ —Fixed Tripper Shuttle

BELTING:
- *☐ —Elevator
- *☐ —General
- *☐ —Hot Materials
- *☐ —Raynile®
- *☐ —Steel Wrapper
- *☐ —Transmission
- ☐ —Woven Wire

☐ **BUCKET ELEVATORS**

☐ **IDLERS**

SCREEN CLOTH:
- ☐ —Electrically Heated
- ☐ —General

VIBRATING SCREENS:
- ☐ —Dewaterizers
- ☐ —General
- ☐ —Heavy-Duty Scalpers
- ☐ —Heavy Media

HOSE:
- *☐ —Acid
- *☐ —Air
- *☐ —Air Drill
- *☐ —Fire
- *☐ —Servall®
- *☐ —Steam
- *☐ —Pinch Valve
- *☐ —Twin-Weld®
- *☐ —Water
- *☐ —Water Suction
- *☐ —Flexible Rubber Pipe

☐ **MECHANICAL FEEDERS**

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*☐ **GROOVED PULLEY LAGGING**

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☐ **MOLDED RUBBER GOODS**

☐ **DESIGN AND CONSTRUCTION OF COMPLETE MATERIALS HANDLING SYSTEMS**

*For immediate information about these industrial rubber products, call your Hewitt Rubber Distributor (See "Rubber Products" Classified Phone Book).

Hewitt-Robins Incorporated
666 Glenbrook Road
Stamford, Connecticut

NAME

TITLE & COMPANY

STREET ADDRESS

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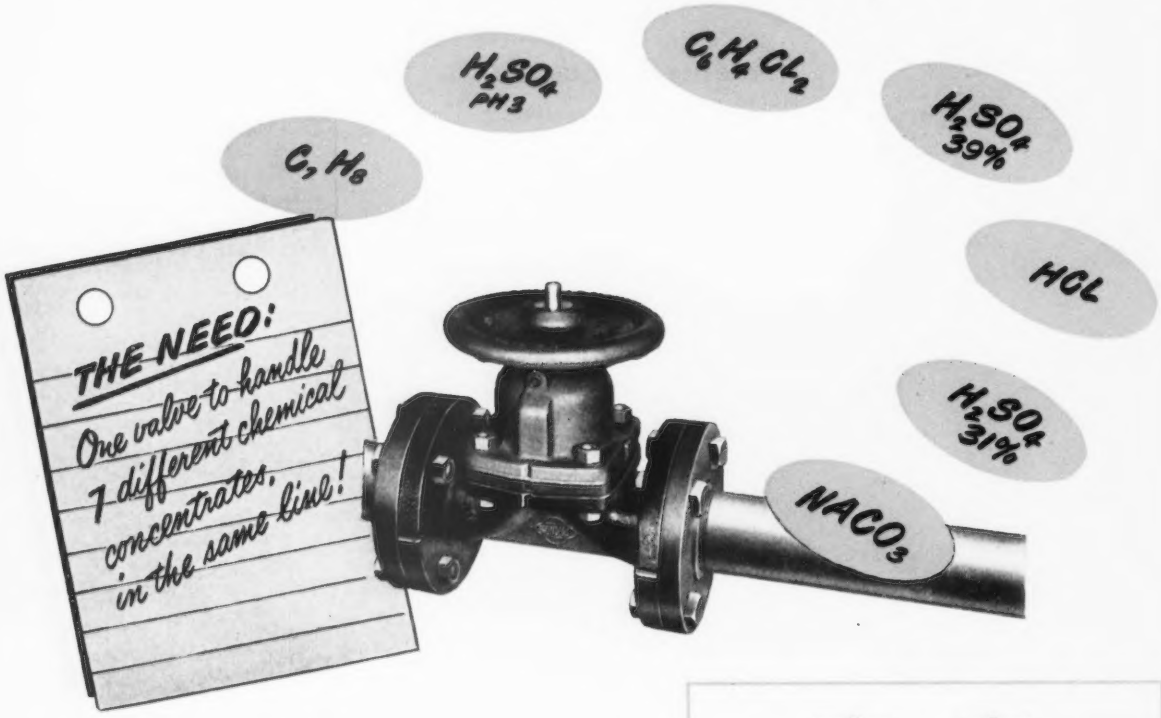
INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

TROUBLE multiplied by 7



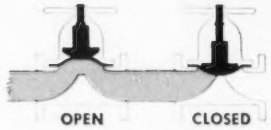
A manufacturer was looking for *one valve* which would handle *seven chemicals* of varying temperatures and concentrations, one after another, in the same line. They were . . .

SODIUM CARBONATE	PH 9	90°C
HYDROCHLORIC ACID	8%	100°C
SULPHURIC ACID	PH 3	20°C
SULPHURIC ACID	39%	42°C
SULPHURIC ACID	31%	15-20°C
TOLUENE	*(Full strength but associated with traces of other chemicals)*	

ORTHODICHLOROBENZENE — Cleaning Solvent

Valves suitable for use with these chemicals individually were available. But only *one valve* was found which could handle them in combination. It was the Grinnell-Saunders Diaphragm Valve, glass lined, with chemically inert KEL-F Diaphragm. The Grinnell KEL-F diaphragm not only prevented the liquid from attacking working parts, but it eliminated leakage around the stem.

Piping in today's complex industrial plants is an exacting science involving the handling of highly corrosive fluids, gases, compressed air, beverages, foods and suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are costly factors. Under such conditions, the amazing adaptability of the Grinnell-Saunders Diaphragm Valve explains its acceptance by industry after industry. For further details, write for Grinnell-Saunders Diaphragm Valve Catalog.



Features which have made Grinnell-Saunders Diaphragm Valves the specified valve in many different industries:

Streamlined flow. Smooth, streamlined passage, without pockets. Frictional resistance at a minimum.

Leak-tight closure against grit, scale, suspended solids.

Working parts absolutely isolated from fluid. Diaphragm completely seals off working parts from fluid in the line.

Body, lining and diaphragm materials to meet service condition. Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum; other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics.

Minimum maintenance. No refacing or reseating is required. No packing glands to demand attention. New diaphragm can be inserted without removing valve body from the line.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

Holes loaded and ready to shoot.

Peak of blast. Confinement is good.

Spent gases appear—air blast avoided.

Well placed final pile. Throw controlled.

the inside story

Here's how ROCKMASTER® blasting helps control throw

THIS blast area on By-pass Route 22, Easton, Pa., was adjacent to gasoline storage tanks, homes, a parking lot, business establishments and a precision instrument factory. It was a ticklish blasting problem for Central Pennsylvania Quarry, Stripping and Construction Co., contractors on the job. Absolute control was a "must." Flying rocks had to be minimized . . . along with noise and vibration.

The ROCKMASTER pattern illustrated above was designed to keep blasted material from falling down the slope. The holes were carefully loaded and adequately stemmed. As the blast was fired, it advanced in alternate delay periods from ROCKMASTER No. 1 to No. 6. The row toward the slope fired first and gave relief for subsequent rows. The general heave inclined toward this relief—up the slope.

When you have shooting problems like this, ROCKMASTER can help you too. Send for your copy of the ROCKMASTER Blasting System Booklet.

ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

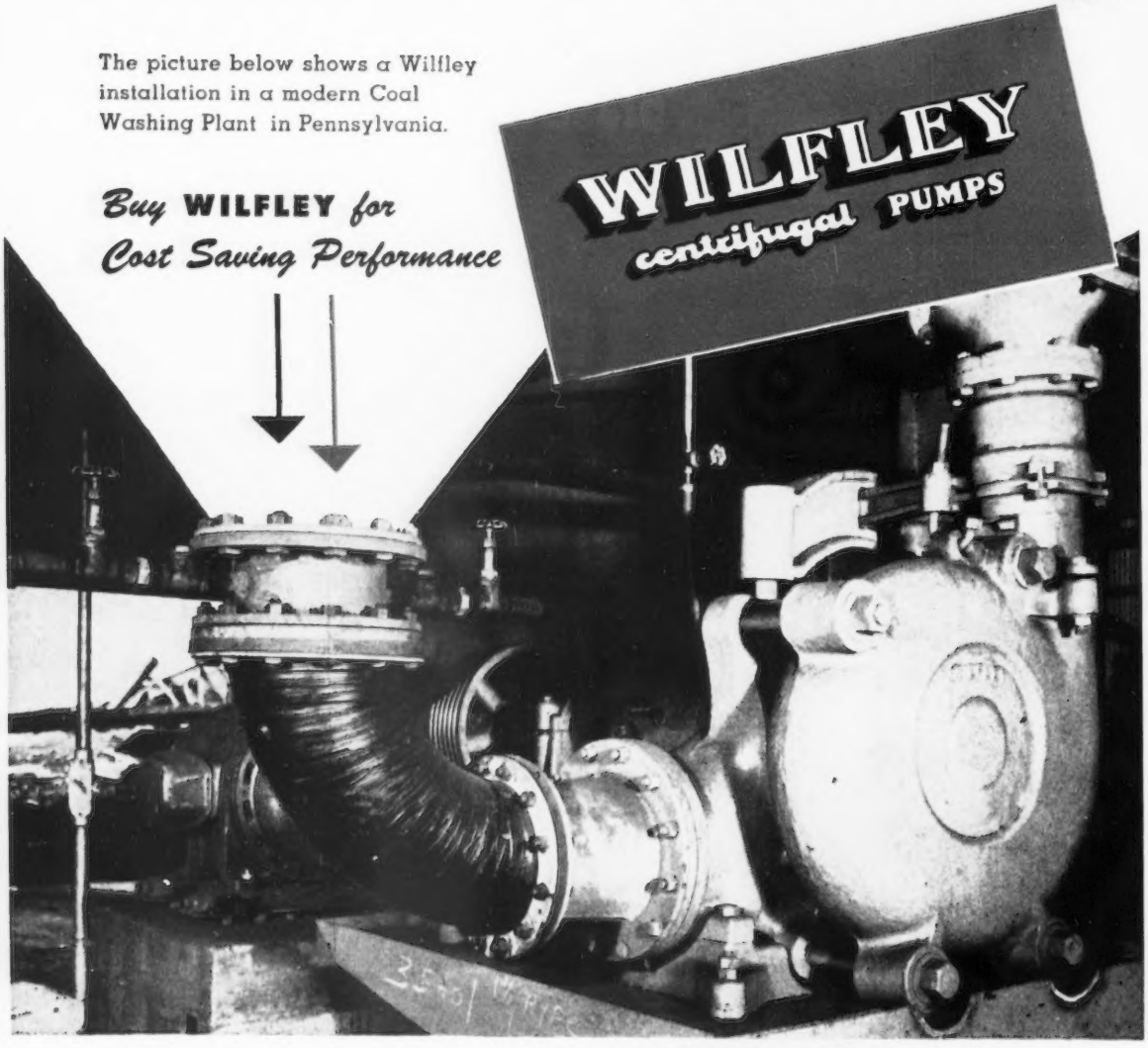
ATLAS POWDER COMPANY, WILMINGTON 99, DELAWARE

Offices in principal cities

coal cleaning

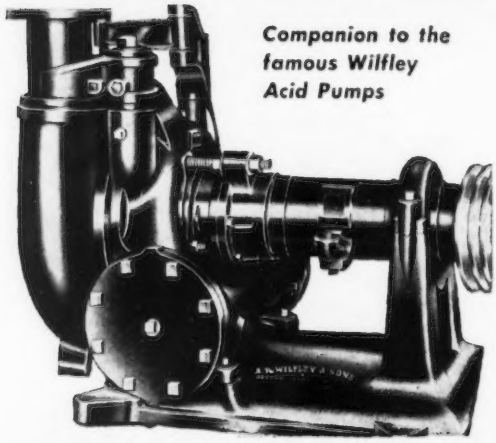
The picture below shows a Wilfley installation in a modern Coal Washing Plant in Pennsylvania.

Buy **WILFLEY** *for Cost Saving Performance*



In coal washing operations Wilfley Sand Pumps always turn in a notably efficient and economical performance. These rugged, dependable pumps deliver continuous, trouble-free performance on a 'round-the-clock schedule—make measurable savings in operating and maintenance costs. Individual engineering on every application. Write or wire for complete details.

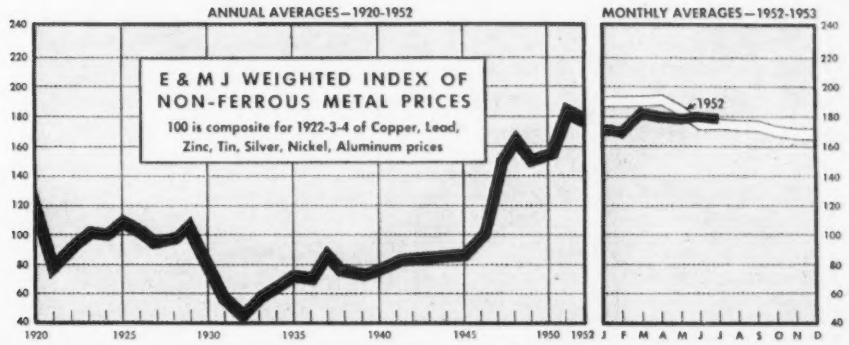
A. R. WILFLEY & SONS, Inc.
DENVER, COLORADO, U.S.A.
NEW YORK OFFICE: 1775 BROADWAY, NEW YORK CITY



Companion to the famous Wilfley Acid Pumps

E&MJ OUTLOOK

PRICES



MARKETS

A bombshell, to put it conservatively, hit the zinc market last month with American Smelting & Refining Co's. announcement of its switch to a delivered price basis for its Prime Western zinc. (See Markets, next page.) The move won approval of some producers; others hope to hang on to the East St. Louis market for quotational purposes, especially for pricing concentrate purchases. Pending gradual unification of pricing policies in the industry, two quotations for zinc must be published.

Continued weakness in tin offset higher lead and aluminum prices last month to ease the *E&MJ* index of nonferrous metal prices to 182.20 for July, against 182.63 for June. It was 179.79 a year ago.

Copper trading was to begin in London August 5. You should know by now which way the price is headed, but as this was written, the consensus of observers was that it would be downward. Copper markets, especially outside the U.S. are definitely weaker.

Lead's advance last month to 14¢ may be hard to hold, although the long-term picture is one of strength. The easier copper market has all metal buyers extremely inventory conscious once more.

•

LABOR

Despite the strike votes won by Mine, Mill at various points, it isn't likely they'll walk out unless they feel driven to it. Mine, Mill's leaders would probably settle for no more than a 10¢ per hour increase, including fringe benefits. A strike would be anathema to the rank and file.

Mine, Mill worries more right now about Senatorial drives to combat Communism in unions than about wage increases. (See *E&MJ*, May 1953, p. 96.)

•

AT HOME

With government spending continuing high, there's no reason why business should drop off drastically this year. Note the lack of a stock market reaction to the Korean truce.

Auto production is, of necessity, being cut back at last. Some drop in steel output is foreseen. The whole outlook for business generally is uncertain, but the general trend is slightly downward.

Keep your eye on New England. Quebec Manitou Mines has a party diamond drilling a copper prospect in the White Mountains in New Hampshire, and in another area, aerial survey work has turned up some awfully interesting relationships in geological structures.

•

ABROAD

With a concession athwart the railroad from Hanna-Hollinger's Labrador iron properties, Canadian Javelin Foundries & Machine Works, a newcomer to iron mining, will bear watching. V. P. Geffine, former Cleveland-Cliffs Iron Co. executive, is a vice-president.

MARKETS—Trends and Prices

A. S. & R. Co. Abandons East St. Louis Basing Point for Zinc—Copper Market Unsettled

THE "QUIET" VACATION MONTH —July—turned out to be a period of unsettling developments in nonferrous metals. Outstanding was the decision of the American Smelting & Refining Co. to abandon the East St. Louis basing point system in selling zinc. The confusion occasioned by this unexpected move, announced July 16, at one time brought five separate quotations into the market on the common grade of zinc. The state of confusion continued right up to the end of the month. Though stocks of copper are accumulating in Chile, no decision was reached in the matter of adopting a new selling policy in that controlled market. Because of the uneasy nature of the truce in Korea this important news was largely ignored by traders.

Price movements in nonferrous metals were irregular. Lead advanced on good buying and higher London quotations; aluminum was moved up to absorb a rise in wages; tin was lower. Those consumers who purchased Prime Western zinc on a delivered basis obtained the metal at a lower price than formerly. Copper was easier in the foreign market. The *E&MJ* index of nonferrous metal prices declined from 182.63 in June to 182.20 in July. However, the drop in tin, resulting largely from excess production, more than offset higher quotations for lead and aluminum.

Zinc Industry Upset

In view of the fact that contracts involving large tonnages of domestic and foreign concentrates, not to mention metal, are based on the East St. Louis quotation for Prime Western zinc, the unexpected move by A.S. & R. Co. to break with the basing point that has been in use for about 50 years caused near chaos in the market place. Unable to shift quickly to the delivered basis in selling the common grade, the market, beginning with July 16, struggled along with two quotations. Several important producers held on the 11¢ basis, East St. Louis, but stood ready to meet competition in the event that the delivered price turned out to be lower than East St. Louis plus freight. One seller, the American Metal Co., moved up to 11½¢ delivered anywhere in the U.S., but could not support this figure as long as A.S. & R. Co. was a seller at 11¼¢, east of the Rockies.

New Jersey Zinc and U.S. Smelting Refining & Mining hoped that a clean break could be made in selling Regular High and Special High apart from that of Prime Western. With the industry divided on this point, no appreciable progress was made during July in establishing separate quotations for the top grades.

In a statement giving its reasons for abandoning the old pricing system, A.S. & R. Co. said:

"1. Prime Western Zinc has been the only major nonferrous metal on which the price to the consumer varies widely depending on delivery point. Current delivery differentials on copper and lead are small. There is no delivery differential whatever on aluminum or on the higher grades of zinc.

"2. The steady rise in railroad freight rates has put consumers in the Atlantic Coast and Pacific Coast areas at too great a disadvantage, pricewise, as compared with Mid-Western consumers. In consequence of the uniform delivered price of High Grade and Special High Grade zinc and the varying price of Prime Western zinc, consumers in certain areas have little or no inducement to use the cheaper Prime Western zinc for purposes for which it would be suitable.

"3. High premiums for Prime Western zinc at Eastern consuming points tend to nullify the effect of the import tariff on shipments from European zinc smelters. Under the East St. Louis basing point system, the European smelter is in a position to realize as high a price at an eastern consuming point, after payment of duty, as the domestic smelter can realize at East St. Louis.

"4. The increased steel making facilities on the Atlantic and Pacific coasts promise an increase in the proportion of Prime Western zinc consumed in these areas, which already use over half of the entire supply of this grade."

Though the basing point system in selling Prime Western zinc has been badly shaken and is probably on its way out, smelters operating in the East St. Louis area may continue to quote an East St. Louis price for some time to come. In these circumstances, *E&MJ* will publish two quotations, not unlike lead.

Copper Weakens Abroad

As the month ended, copper consumers, here and abroad, were marking time pending developments in connection with the resumption of trading on the London Metal Exchange. The lull in buying has resulted in some unsettlement in copper for forward delivery, particularly outside of this country. The U. S. market for domestic metal averaged a shade under 30¢, Valley, for July. The foreign market opened the month at 29.725¢, f.a.s. N.Y. equivalent, but ended at 28.90¢. October metal sold in the foreign division at 28½¢ and dealers quoted down to 28¢ on November-December copper.

Wire and brass mills in the U. S. lowered their selling basis on copper wire to the 30¢ level. Brass mills have not yet taken this step and continued to price their products on 32.6¢ copper.

Nothing definite has come out of Chile in reference to its difficulties in marketing its production at 35½¢ f. o. b. Chilean ports, correcting its exchange problem, and meeting new wage demands at Anaconda's Chilean mines. Braden is reported to have cut its production 30%. In the meantime, some 65,000 tons of Chilean copper have accumulated out of current production of the large and small mines.

Lead had a good month. London was

Average Prices for July (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.687
Electrolytic, export, refinery ..	29.482
Lead	
Common, New York	13.683
Common, St. Louis	13.483
Silver and Sterling Exchange:	
Silver, New York per oz.	85.250
Silver, London, pence per oz. ..	74.000
Sterling Exchange, "Checks"..	281.530
Zinc:	
Prime Western East St. Louis	11.000
Tin:	
New York Straits	81.577
New York, 99% min. ....(e)	80.577
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$190.462
Antimony (E&MJ) (d)	37.970
Antimony, bulk, Laredo	34.500
Antimony, in cases, Laredo	35.000
Platinum, refined, per oz. ..	$93.000
Cadmium (a)	200.000
Cadmium (b)	207.500
Cadmium (c)	215.000
Aluminum, 99% plus, ingot	21.000
Magnesium, ingot	27.000
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

Markets Continued on Page 124

higher in what appeared to be an oversold market, and business here was fairly active. The price advanced to 14¢, N.Y.

Tin lost more than 10¢ per pound, selling down to 78¢ on prompt Straits quality metal late in the month. Low prices are forcing a reduction in output in Malaya.

Quicksilver was unsettled, ending the month at $190 per flask on metal produced in Europe. Mexican quicksilver was available at concessions.

Manganese ore turned dull on a comfortable supply situation and uncertainty over the rate of production in the steel industry.

"Free" Gold Market

Price movements in "free" gold markets were narrow. Trading volume declined in July by about 18%, compared with June. Major event was the freeing of internal and external gold trade in Colombia. It was rumored that Japan will free its internal gold restrictions. Pick's World Currency Report quotes on "free" gold as follows, per fine oz.:

	COINS		BARS (12.5 kg.)	
	June 30	July 31	June 30	July 31
NEW YORK, transit	.....	.....	$36.55	$36.50
MANILA	$43.75	43.50	35.60	36.25
HONG KONG	45.00	44.50	39.30	38.70
BOMBAY	48.10	49.00	47.60	48.00
TANGIER	44.25	43.75	36.55	36.45
BEYROUTH	44.25	43.50	36.65	36.60
PARIS	50.25	49.75	37.50	36.50
BUENOS AIRES	45.00	44.00	41.00	41.00

Note: All prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

July 1953	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
1	29.700	29.650	89.500	13.500	13.300	.....	11.000
2	29.700	29.650	88.250	13.500	13.300	.....	11.000
3	29.700	29.675	87.000	13.500	13.300	.....	11.000
4	No Market	29.625	Holiday	Holiday	Holiday	.....	Holiday
6	29.675	29.625	84.750	13.500	13.300	.....	11.000
7	29.700	29.625	82.750	13.500	13.300	.....	11.000
8	29.700	29.650	83.000	13.500	13.300	.....	11.000
9	29.650	29.675	83.500	13.500	13.300	.....	11.000
10	29.700	29.650	83.000	13.500	13.300	.....	11.000
11	No Market	29.625	83.000	13.500	13.300	.....	11.000
13	29.700	29.700	82.000	13.500	13.300	.....	11.000
14	29.700	29.375	81.000	13.500	13.300	.....	11.000
15	29.700	29.550	80.500	13.500	13.300	.....	11.000
16	29.700	29.550	80.500	13.500	13.300	11.250	11.000
17	29.675	29.375	80.750	13.500	13.300	11.250	11.000
18	No Market	29.775	80.750	13.500	13.300	11.250	11.000
20	29.700	29.700	79.750	13.750	13.550	11.250	11.000
21	29.625	29.200	78.500	13.750	13.550	11.270	11.000
22	29.675	29.075	78.750	13.750	13.550	11.455	11.000
23	29.650	29.325	79.750	14.000	13.800	11.325	11.000
24	29.675	29.275	80.250	14.000	13.800	11.500	11.000
25	No Market	29.075	80.250	14.000	13.800	11.250	11.000
27	29.700	29.375	78.000	14.000	13.800	11.300	11.000
28	29.675	29.450	79.250	14.000	13.800	11.325	11.000
29	29.700	29.450	79.500	14.000	13.800	11.300	11.000
30	29.700	29.500	78.500	14.000	13.800	11.250	11.000
31	29.700	28.825	78.250	14.000	13.800	11.250	11.000
AVERAGES FOR MONTH							
July	29.687	29.482	81.577	13.683	13.483	—	11.000
AVERAGES FOR WEEK							
July							
1	29.690	29.617	90.750	13.500	13.300	—	11.000
8	29.695	29.642	85.150	13.500	13.300	—	11.000
15	29.690	29.596	82.167	13.500	13.300	—	11.000
22	29.675	29.446	79.833	13.625	13.425	11.288	11.000
29	29.680	29.325	79.500	14.000	13.800	11.333	11.000
CALENDAR WEEK AVERAGES							
July							
4	29.695	29.638	89.200	13.500	13.300	—	11.000
11	29.685	29.642	83.333	13.500	13.300	—	11.000
18	29.695	29.554	80.917	13.500	13.300	—	11.000
25	29.665	29.275	79.542	14.000	13.800	11.342	11.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

July 1953	Sterling Exchange "Checks"	Silver (c) New York	Silver (c) London	Gold London	Gold (d) United States
1	281.3750	85.250	74.000d.	248s.	$35.00
2	281.4375	85.250	74.000d.	248s.	35.00
3	281.5625	85.250	74.000d.	248s.	35.00
4	(e)	(e)	(e)	(e)	35.00
6	281.6250	85.250	74.000d.	248s.	35.00
7	281.6250	85.250	74.000d.	248s.	35.00
8	281.5625	85.250	74.000d.	248s.	35.00
9	281.6250	85.250	74.000d.	248s.	35.00
10	281.6250	85.250	74.000d.	248s.	35.00
11	(e)	(e)	(e)	(e)	35.00
13	281.6250	85.250	74.000d.	248s.	35.00
14	281.6250	85.250	74.000d.	248s.	35.00
15	281.5000	85.250	74.000d.	248s.	35.00
16	281.5000	85.250	74.000d.	248s.	35.00
17	281.5000	85.250	74.000d.	248s.	35.00
18	(e)	(e)	(e)	(e)	35.00
20	281.3125	85.250	74.000d.	248s.	35.00
21	281.6250	85.250	74.000d.	248s.	35.00
22	281.3125	85.250	74.000d.	248s.	35.00
23	281.6250	85.250	74.000d.	248s.	35.00
24	281.5000	85.250	74.000d.	248s.	35.00
25	(e)	(e)	(e)	(e)	35.00
27	281.5000	85.250	74.000d.	248s.	35.00
28	281.5000	85.250	74.000d.	248s.	35.00
29	281.5000	85.250	74.000d.	248s.	35.00
30	281.5625	85.250	74.000d.	248s.	35.00
31	281.5625	85.250	74.000d.	248s.	35.00
AVERAGES FOR MONTH					
July	281.530	85.250	74.000d.	—	—
AVERAGES FOR WEEK					
July					
1	281.375	85.250	—	—	—
8	281.563	85.250	—	—	—
15	281.600	85.250	—	—	—
22	281.450	85.250	—	—	—
29	281.525	85.250	—	—	—

Calendar Week Averages, New York Silver: July 4th, 85.250; 11th, 85.250; 18th, 85.250; 25th, 85.250.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300¢ per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075¢ for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125¢ to 0.15¢ per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered, in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35¢ per pound over the current market for Prime Western; Special High Grade 1.50¢.

(f) Prime Western zinc sold on delivered basis, east of Continental Divide.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5¢ per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at .99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines...

G.P. Lutijen

A geologist friend of ours is doing whatever it is that geologists do, in Spain this summer. He has been teamed up with one of the local rockhounds on an exploration project that has run headlong into a severe language barrier—a case of pure Castilian vs. pure Ohioan.

It's not that our friend hadn't taken steps to meet the situation. He had heard some time ago that Spain was full of foreigners, and while still in the U. S. he spent several months in the study of Spanish. As a matter of fact he bought a book entitled "Conversación Español—Spanish Conversation" which seemed like a good bet, starting out as it did being so helpful right on the cover. By embarkation time, he had at his command useful sentences like "The old cigar-maker is carving good quills out of chartreuse ostrich feathers" and other stimulating conversational bits.

He felt he was ready, but one can imagine his disappointment when he found that in Spain they didn't appear to have learned the language from a book of any kind.

Overcoming his initial dismay, our friend started out into the field with his compañero geologico (geologic companion) with both men making the best of the abyss that yawned between their respective native tongues. However, the lively program of pounding on rocks and flapping their English-Spanish dictionaries in the breeze came to a climax on the third day.

They were tramping through a pleasant field at the time. Our friend, out of the corner of his eye, noticed some livestock nearby but thought nothing much of it as he was busy watching his compañero thumbing frantically through his diccionario (dictionary). Finally the Spaniard found the words he was seeking. "It is convenient that we go," he said, and with that took off for a distant fence like Native Dancer on a fast track.

Our geologist friend, vaguely suspicious that something was amiss, lit out too (in fact he beat compañero to the fence), but it wasn't until several days later that he learned that they had been strolling on the domain of persons engaged in raising toros for the national pastime. The livestock he had barely noticed are widely advertised as the "fiercest bulls in Christendom." In Spanish, of course.

Mr. L. R. Hill is the manager of the Materials Engineering Dept. of Westinghouse Electric Corp.'s East Pittsburgh plant. He was talking about the development of magnetic amplifiers for automatic controls when he asked the rhetorical question: " . . . To produce modern materials for high performance Magamps, how can all of the numerous variables be investigated and optimum conditions be obtained for their control?"

As is customary with rhetorical questions, he forthwith proceeded to the answer.

"Fortunately, during the past few years, new mathematical techniques have been developed which permit experiments in a radical manner. The classical admonition of many scientific investigators is, 'Hold everything constant and vary only one thing at a time.' The new technique is to put everything into the same pot, stir well and then use a computer to unscramble the results! A typical example concerns a recent experiment which was run to determine the simultaneous effect of four different core damping fluids, three different core materials, four different magnetic classifications, and two structural modifications of the core. Using the classical approach, this investigation would have required a minimum of 2,300 test samples and about 138,000 electrical measurements to obtain acceptable quantitative data on which to base the processing. Use of the new experimental techniques accomplished the same results with only 96 samples and 6,300 electrical measurements. The precision of measurement in the latter case exceeded that of the classical experiment to a significant degree."

There's no reason why the statistical approach with its greater accuracy and less work cannot be applied to the mineral industries. On page 97 you can see for yourself the startling discovery that Magma Copper made when they applied the new technique.

"The Remarkable Case of the Copperhill Ball Mill" in the June issue has turned into an old-fashioned cracker-barrel session among the ore-dressing division of our readers. You might say we had a tiger by the tail. Not that we want to let go! As a matter of fact we are quite pleased to have the pages of *E&MJ* used as a forum for a lively discussion of a controversial type like grinding.

Contributions to the discussion have come in from all over and in September we plan to publish same. The commentaries run the gamut from technical data to sheer philosophy of grinding. You'll find some radical, some amusing, all of them provocative. If grinding is your vocation or avocation, stand by for September.

The Mine-Mill soap box boys might not believe it but, the average mine operator, big or small, not only wants to keep his miners happy but recognizes the value of doing so. Obviously one of the easiest ways to accomplish this is to give the boys more money—the happy cabbage. In this issue we have a story of how one company increased bonuses from $6.25 to $8.80 per shift and at the same time was able to cut costs as drift footage went up from 1.71 to 2.64 ft. per man shift. This type of development has been known to cause large smiles from the front office to the stopes. It's even pleasant to read about and may give you ideas for similar accomplishments at your own diggings. The whole story is on page 92.

ENGINEERING AND MINING JOURNAL

AUGUST, 1953

The Bureau and Politics

WE DON'T PROPOSE to rake over at this point the sequence of events nor the personal responsibilities connected with the nomination of Tom Lyon as director of the U. S. Bureau of Mines. We should like, however, to examine the situation revealed by these events because it badly needs examining.

Few people, except those innocent of any knowledge of practical politics, have been surprised by the simple directness with which the Eisenhower Administration has eliminated Democrats from policy-making jobs in government and replaced them with Republicans. Some of these political executions and replacements have reflected little credit on the new leadership, but we have space here to consider only the USBM directorship.

In recent years, the top job in the Bureau of Mines has become a political plum of sorts, dangling under the glare of John L. Lewis and swinging in the winds of all manner of pressures.

Why should this be? Why is the Bureau a prey to politics and the U. S. Geological Survey not? No one (we fervently hope) has considered paying a political debt with Dr. Wrather's position, why should the USBM be so regarded?

This shifting of directors and philosophies, every so often, certainly keeps the Bureau in a state of uncertainty, if not turmoil. Each new director feels an obligation to re-organize, or to "streamline" the Bureau, or else he feels certain activities should be greatly expanded or sharply curtailed, as the case may be. The result, obviously, is that the permanent Bureau personnel, the men and women who will be there come Dem. or Rep., and who must keep the job going, are periodically reshuffled, exasperated, puzzled, dismayed, and frustrated.

What the Bureau of Mines needs is a good, capable, non-political director who can take time to learn how the Bureau ticks, and who will be equipped with a clear idea of the general area in which the Bureau ought to operate. Then he should be left alone to weave the Bureau into a smoothly-functioning efficient agency doing the jobs for which it is intended.

What are those jobs? Without going into detail, it seems to us the Bureau's functions are properly these: the propagation of safe methods of mining and the training of mine rescue crews; the collection and rapid publication of statistics on the mineral industries; research on problems of mining, milling, and smelting, with results freely available to private industry; the administration of such aids to industry as the DMEA exploration program. There are, of course, other less important activities the Bureau might, and does, engage in. We don't think, however, the Bureau ought to run custom mills, smelters, or operate mines.

Nor do we think the Bureau ought to be called upon to police the new Mine Safety law. We side with Tom Lyon in feeling that this law is an administrative nightmare, impossible to police without a tremendous increase in staff.

The Bureau is not, and should not be, an enforcement agency. As long as the law is on the books, and if it is to be enforced, the responsibility should be in some other agency properly set up for it, the Department of Justice, for example, or the Department of Labor.

Of course, our conviction is that safety is primarily the concern of management, not the state or the nation. The outstanding safety records of several companies have proved that intelligent safety measures, enforced by management, not by government, do the best job. Management has to believe in safe operation, prove its sincerity to its foremen, and in turn secure the cooperation of labor. If this is done, safety laws will be no problem. We would not make this statement so confidently if we did not have evidence that it can be done.

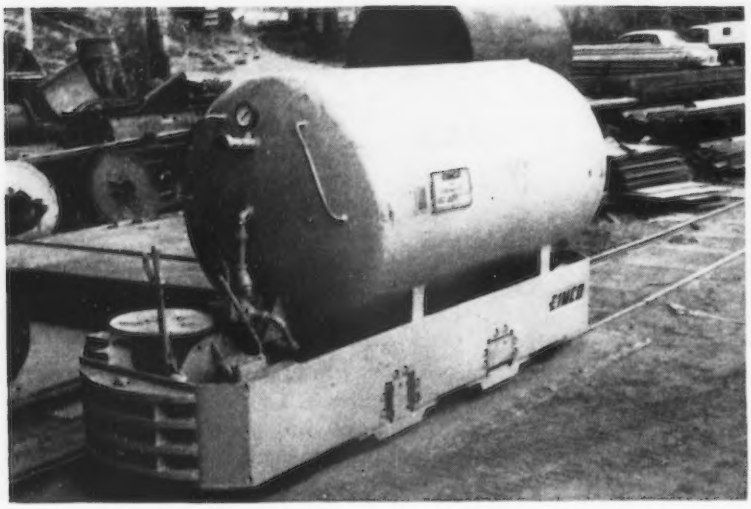
Mining probably never will be the safest occupation in the world, but it can be made a lot safer than it is now in many mines. Real progress in that direction will come through intelligent cooperation between management and men, not by governmental enforcement.

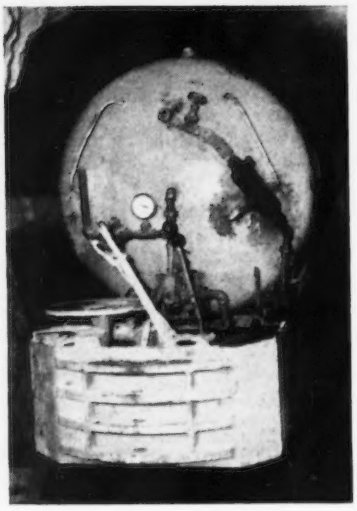
Here is an opportunity for the Eisenhower Administration to show that it can rise above the tactics of cut-throat political patronage when the situation demands it.

Here is the Administration's chance to appoint a non-partisan, capable director for the U.S. Bureau of Mines and to so organize his job that he can proceed to do it to the best of his ability without the fear that a new Administration may toss him bodily into the ash-can.

The Bureau deserves it. The mining industry deserves it. Let's hope that respect, continuity and strength may soon be brought to this post.

Equipment Shown Below . . .





TWO-SPEED COMPRESSED AIR LOCOMOTIVE weighing 3,260 lb. with 58-cu. ft. receiver arrived from Eimco factory (left). Gear speed ratios were modified and the unit was installed for drift haulage as shown at right.

Granby Adopts Air Trammers— Cuts Drifting Labor Costs 26%

D. W. PRINGLE
Assistant Mine Superintendent,
Granby Consolidated Mining,
Smelting and Power Co., Ltd.,
Copper Mountain, B. C.

SUBSTITUTION OF A two-speed air locomotive and 3-ton automatic dump car for hand tramming methods at the Copper Mountain mine of Granby Consolidated, British Columbia, resulted in labor savings of 26%. In one drift heading with a tramming distance of over 900 ft. the contract price for labor was reduced from $13.05 to $7.50 per ft., a reduction of 42.5%. The drifting crew in this long heading was reduced from five men to two men, while bonus earnings per man increased almost 41%.

For the past several years, numerous articles have appeared concerning the use of small compressed air locomotives for underground tramming, particularly as an aid for advancing drift headings. This led to the building of such a machine in the Copper Mountain shops in 1950, which, however, was unsuccessful. In the summer of 1951 the writer investigated the use of this type of machine in the Coeur d'Alene district in Idaho and was convinced that with suitably designed equipment, major reductions in the cost of drifting could be achieved.

The standard drifting crew consisted of two miners, one mucking machine operator, and one helper and required two 8-hr. shifts for an average advance of 7.12 ft. as shown in Table 4. The round was drilled by two miners using 44-lb. jackhammers mounted on air legs and integral steel tipped with a tungsten carbide chisel or four-wing bit. An average round consisted of from twenty to twenty-six 7½-ft. holes. Permanent track and pipe installations were made on the drilling shift by company men or by the contract crew which was allowed company time for such work.

On the mucking shift, the mucking machine operator and helper first wet down the muck pile and barred down loose rock. Then, using a high deck mucking machine and a 1¼-ton end-dump car, they loaded from 15 to 21 cars which were hand trammed to a dump. When the tramming distance reached 900 ft., an extra helper was required. The contract price was then increased to yield the same bonus as the four-men crew would have earned for the same footage advance. As shown in Table 4 this necessitated an increase from $10.64 to $13.05 for labor only.

Drifting bonus is computed by multiplying the price per foot times the footage advanced in each two-week period. From this figure the total wages are subtracted and the balance is divided evenly among the crew in proportion to the man-shifts worked. Miners' wages per 8-hr. shift are $12.66; mucking machine operators, $12.24; and helpers, $11.44. The basic price for drifts up to 8x8 ft. in size using the equipment outlined above is $10.14 per ft. with $0.50 per ft. increase for every 500 ft. of tram. Table 3 shows the earnings possible at this price for different footage advances. Under the heading "Old Contract Price" in Table 4, the average bonus for 628 ft. of advance was $6.25 per man-shift for an average advance per round of 7.12 ft.

Today's Drifting Methods

The writer had observed the one-speed air locomotive and auto-dump cars in operation in the Coeur d'Alene mining district. From these time studies it was concluded that a two-man crew could complete a cycle (i.e. muck out a round, drill

. . . Resulted in Economies Revealed in These Tables.

TABLE 1—Estimated Drifting Cycle

	Hr.	Min.
1. Traveling to face, barring & wetting muck pile	0	30
2. Loading, tramming, dumping 9 cars @ 12 min. each (1,000 ft. of tram)	1	48
3. Lunch	0	30
4. Drilling twelve 5-ft. holes @ 6 in. per min. (per machine)	2	00
5. Removing drill gear and blowing holes	0	20
6. Loading and blasting round	0	20
7. Traveling time to surface	0	30
Total time required to complete cycle	5	58
Balance of 8-hr. shift for track work, pipe work, etc.	2	02

off, and blast) with 8-ft. steel on a short tram, and with 6-ft. steel on a long tram. As a result, an air locomotive was purchased and a special dump car built in our shops.

The Air Locomotive

The air locomotive is a 3,260-lb. unit, equipped with a 58-cu. ft. receiver and air motor as shown. The 7½-hp. air motor is coupled by an oil-bath friction clutch to a two-speed gear box. The gear box has a reduction ratio of 1.5:1 in high and 3.5:1 in low, and from the drive sprocket to the axle the reduction ratio is 2.5:1. Both axles are joined by a drive chain producing a four-wheel drive which gives ample traction for pulling heavy loads. Low gear is used for starting with a heavy load or when the air pressure in the tank is low. High gear is used after the locomotive is moving, for good track conditions, and with good air pressure. Neutral is used for coasting on good track. Since low gear was seldom used at Copper Mountain because of the straight track, the rear end ratio was changed to 2:1 which had the effect of increasing both the range of travel and the speed in both gears.

This change was made to the locomotive when it was operating on a 1,400-ft. tram. Some crews were charging the receiver going out. After this change was effected, the trip out was made with one tank of air. This drift broke through 1,904 ft. from the dump. When the air pressure was above 85 lb. the tank was charged four times for the round trip; at the face on the out trip, at the dump, at 600 ft. and at 1,200 ft. on the return trip. Average speed over the round trip distance was 5.5 mph.

TABLE 2—Summary of Advances and Bonus Earned During Trial Period

Date	Man Shifts	Rounds	Footage Average	Footage Total	Bonus Average	Bonus Total	Tramming Distance, ft.
May 1-15	46	24	4.75	114	$8.40	$386.64	710- 824
May 16-31	50	25	5.08	127	8.93	446.82	824- 951
June 1-13	34	17	5.00	85	8.59	292.06	951-1,036
Total and Averages	130	66	4.94	326	$8.65	$1,125.52	873

TABLE 3—Possible Bonus Earnings per Man Shift at Various Prices

Length of Advance, ft.	New prices and a 2-man crew $8.50/ft.	$7.50/ft.	$7.00/ft.	Old price and a 4-man crew $10.14/ft.
5	$ 8.59	$ 6.09	$ 4.84	$0.42
6	12.84	9.84	8.34	2.96
7	17.09	13.59	11.84	5.49
7½	19.21	15.46	13.59	6.76

TABLE 4—Comparison of Old and New Contract Prices

4-270 DRIFT—OLD CONTRACT PRICE

Period	Price	Adv. (ft.)	Miner Shifts	Adv. per round	Mucker shifts	Total shifts	Bonus per man shift	Ftg. per. man shift	Tram distance, ft.
Jan. 1-15	$10.14	39	10	7.80	10	20	$7.52	1.95	356- 395
Jan. 16-31	10.14	53	15.5	6.84	16	31.5	4.84	1.68	395- 448
Feb. 1-15	10.64	16	19.5	6.97	20	39.5	5.47	1.72	448- 516
	10.14	52							
Feb. 16-29	10.64	50	14	7.14	14	28	6.75	1.78	516- 566**
Mar. 1-15	10.64	64	20	6.40	19.5	39.5	4.98	1.62	586- 650
Mar. 16-31	10.64	73	20	7.30	20	40	7.14	1.82	650- 723
Apr. 1-15	10.64	41	10.75	7.63	11.5	22.25	7.16	1.84	723- 764
Apr. 16-30	10.64	58	16	7.25	16	32	7.01	1.81	764- 822
May 16-31	10.64	16	8	7.00	10	18	5.99	1.55	822- 850
	*13.05	12							
June 1-13	*13.05	50	13.5	7.41	21½	35	6.55	1.43	850- 900
Totals & averages		524	147.25	7.12	158.5	305.75	$6.25	1.71	628

NEW CONTRACT PRICE

Sept. 16-26	7.50	55	32	5.25	31	63	$8.24	2.67	945-1,113
	8.00	113							
Oct. 1-15	8.00	99	16.5	6.00	17.5	34	10.63	2.91	1,113-1,212
Oct. 16-31	8.00	152	37.5	4.05	28	65.5	5.90	2.32	1,212-1,364
Oct. 30-Nov. 13	8.00	157	28.5	5.51	28.5	57	9.46	2.75	1,364-1,521
Nov. 14-29***	8.43	164	29	5.66	29	58	11.53	2.86	1,521-1,685
Nov. 30-Dec. 13	8.43	177	34.5	5.13	34	68.5	8.61	2.58	1,685-1,862
Dec. 14-28	8.43	42	8	5.25	9	17	7.65	2.47	1,862-1,904
Totals & averages		959	186.0	5.16	177.0	363.0	$8.80	2.64	1,424

Notes: *Price adjusted for extra helper on mucking cycle. **20 ft. advance done during test work. ***Wage increase.

Charging the air locomotive is accomplished by using an automatic shut-off quick-change valve. Charging stations are spaced about 600 ft. apart. Usual charging time is about 40 to 60 sec., depending on the tank pressure.

The auto dump car is a 50-cu. ft., 3-ton, side-dump car as shown. Two 8-in. air cylinders, one on each end of the car and controlled from the locomotive by the motorman, dump the car. A minimum of air pressure of 60 psi is required to actuate the dumping mechanism.

With the use of this equipment, it was estimated that two men

TABLE 5—Actual Drift Cycle

	Hr.	Min.
1. Traveling, headframe to heading	0	23
2. Muck out round 9 cars @ 11 min. each	1	38
3. Setting up	0	07
4. Drilling 11 holes per machine @ 7½ min. each	1	24
5. Lunch	0	35
6. Tear down, blow holes, load, spit	0	43
7. Miscellaneous	0	18
8. Heading to 5L station	0	23
Total time required to complete cycle	5	31
Balance of 8-hr. shift for pipe work, track work, surveyors, etc.	2	29

AUTO-DUMP CAR contains two 8-in. air cylinders mounted on either end of car. Compressed air from the locomotive receiver dumps the mine cars.

would be able to complete the cycle shown in Table 1.

In the case of a short tram it would be possible to drill 8-ft. steel and average 7.5 ft. advance per round. At the standard price of $10.14 per ft. a $25.00 bonus per man would be possible.

Union Negotiations

In accordance with our union agreement, contract prices cannot be changed until agreement has been reached with the Union Contract Committee. Therefore, on April 7, 1952, a letter was written to the union requesting re-negotiation of the contract price for an 8x8-ft. drift using this modern equipment.

Our first meeting was held on April 19, 1952. The union committee at first refused to consider any reduction in contract price which they contended involved speed-up and possibly paying for company equipment by reducing contract drift prices. They also intimated that they did not think the air locomotive would speed up the tramming sufficiently to permit cycling. The basis on which the company officials requested this reduction was the maxim—"equal bonus for equal effort." After a lengthy discussion a trial price of $8.50 per ft. was set for the first 300 ft. of advance.

By June 13 the trial distance had been driven. As shown in Table 2 the bonus earned was $8.65 per man-shift for an average round of 4.94 ft. where the average tramming distance was 873 ft. See Table 3.

During the trial period all crews admitted that with the aid of this modern equipment their physical effort was definitely less. On the basis of the above performance and additional time studies, the company officials then considered a fair and reasonable price would be $7.00 per ft. as shown in Table 3.

At this price for a 7-ft. advance, the bonus would be increased from $5.49 per shift to $11.84 per shift. On the other hand the company would have a direct saving of $3.14 per ft. on the basic price.

A Compromise Reached

The July 4, 1952, meeting produced a compromise price of $7.50 per ft. with a $0.50 per ft. increase from a 1,000 to 1,500-ft. tram and a $0.25 per ft. increase for each additional 500 ft. of tram. This price is still a little high but the principle has been established of reducing contract prices when new equipment or techniques can be applied. Table 4 shows the drift performance in 4-270 drift under the old contract and under the new contract.

Table 4 shows that tramming distance increased from 356 to 1,904 ft. The average bonus earnings increased from $6.25 per shift to $8.80 per shift. It also shows that the advance per man shift increased from a low of 1.43 ft. to a high of 2.91 ft. or an average increase from 1.71 ft. to 2.64 ft.

A time study of a typical round after the men had become accustomed to the equipment appears in Table 5.

This time study of an actual cycle is very close to our theoretical cycle proposed to the union committee. It also shows that the price is still high.

Air vs. Storage Batteries

The question naturally arises as to the relative merits of this type of compressed air locomotive compared with the conventional 1½-ton storage battery locomotive which is often used for this type of work. In our opinion each has its place. The compressed air locomotive costs less than half as much as the storage battery locomotive. It can be operated with relatively unskilled labor since supervising and charging of batteries does not have to be considered. Using the air from the locomotive air tank to dump the car is a great advantage. On the other hand the battery locomotive would appear to be the answer for longer hauls, particularly if it is desired to switch cars at the face, make up a train of several cars, and haul to a dump several thousand feet away, for example.

The air locomotive and the auto-dump car have been very effective for drifting, producing the following results: less physical effort on the part of the workman with an increase of bonus earnings, a decrease in drifting costs for the company and a decrease in the total number of men employed.

Much of the credit due to the success of this achievement belongs to the workmen involved and to the officials of the local union for their cooperation.

The writer wishes to thank the Granby company for permission to publish this paper. Special thanks are due J. A. C. Ross, mine superintendent and P. E. Olson, test engineer, for their valuable assistance in the preparation of this article.

Should the Silver Profits Tax Be Removed? *Commodity Exchange Says Yes—*

Removal could restore a free market in silver futures in New York.

HERBERT M. BRATTER
Washington, D. C.

THE SILVER PURCHASE ACT of 1934 provides a tax of 50% on profits derived from the sale of silver. This tax, still in existence, was intended to prevent speculators from profiteering in connection with the Government's purchases of silver. In a letter of May 27, 1953, to Chairman Daniel A. Reed of the House Ways and Means Committee, the Commodity Exchange, Inc., asked for Congressional repeal of the special tax in order to restore a free market in silver futures in New York.

The letter does not ask for repeal of the rest of the Silver Purchase Act. If the Ways and Means Committee and the Congress carry out the repeal and the tax is removed, the world price of silver will attain a freedom of movement in response to economic forces such as it has not had since 1934. But a long road stretches between this move by the Commodity Exchange and attainment of its goal.

Supporting the effort of the Commodity Exchange are various silver producers and professional bullion traders. Opposed are the chief consumers organized as the Silver Users Association, which maintains a legislative counsel in Washington. These silver users favor a repeal of the special silver tax only if the entire silver purchase program is repealed; they want **all** government intervention in silver removed in order that the "laws of supply and demand" may operate freely. But they have never been able to get a movement started in the Congress for repeal of the silver purchase program. Nor does there seem to be any prospect that the Eisenhower administration wants to tackle the Senate silver bloc, which doubtless is as strong and watchful as ever.

Since the Republican regime stands staunchly for free markets and free enterprise, repeal of the silver tax without repeal of the rest of the silver program might stand a good chance if both producers and users of the metal united in asking for it. But the "all or nothing" stand of the Silver Users Association seems to spell "nothing." Since important silver users have not always taken the "all or nothing" position, any switch in their present opposition to tax repeal without repeal of the silver purchase program might prove significant.

Tax Prohibits Trading

The silver tax, which amounts to 50% of the profit derived from the sale of silver, for all practical purposes is a prohibitive tax so far as public trading in silver is concerned. Those who drafted the Silver Purchase Act of 1934 intended the tax to be prohibitive. The idea was that the U. S. Treasury was being empowered and expected to buy large quantities of silver in the open market and that Treasury purchases would be more difficult and more costly if speculators, trading perhaps on tips from Washington, were left free to operate. When the Treasury cleared the decks for its large silver purchases by nationalizing, on August 9, 1934, all silver bullion held by the public, continuance of silver futures trading became impossible and the Commodity Exchange closed its facilities (futures trading in silver began in New York in 1931) in this metal.

Not long afterwards efforts were made by traders and others to get the silver tax repealed. In 1935 Senators Pat McCarran of Nevada and Elmer Thomas of Oklahoma—both strong supporters of the silver purchase legislation—sought to have the silver tax killed. Ten years later Senator McCarran, in October 1945, sponsored similar efforts but they were coldly smothered by the Treasury Department, which consistently took the view that the tax helped it carry out the discretionary mandate of the 1934 act.

The Commodity Exchange, in its appeal to the Ways and Means Committee, argues that the reasons given in past years for retention of the silver tax are no longer cogent. In effect, says the Exchange, the Treasury's 1934 purchase mandate is a dead letter. The present argument of the Exchange can hardly be more concisely stated than by quoting in full the letter which its president, William Reid, addressed to Congressman Reed on May 27, 1953.

Hon. Daniel A. Reed, Chairman
House Ways and Means Committee
Washington, D. C.

Dear Mr. Chairman:

Since August 1934 the free market in silver futures on this exchange has been closed because the 50% silver transactions tax contained in Section 8 of the Silver Purchase Act of 1934 makes trading prohibitive. Before the enactment of this tax provision in 1934, silver miners, fabricators, bullion and foreign exchange brokers from all quarters of the world used the facilities of the Exchange to effect price insurance by hedge purchases and sales.

At a time when in other fields the U. S. Government is seeking to permit free play to demand and supply on open markets, e.g., the interest rate; and when countries abroad, such as the United Kingdom, have returned to freedom the British markets in such world commodities as cotton, copper, tin, lead, zinc, etc., the Commodity Exchange, Inc., earnestly calls your attention to the desirability of restoring New York as a world silver trading center.

The purpose of the 1934 silver tax was to shut off private trading in silver so as to leave the Treasury Department free to carry out the large silver-purchase program on which it was then embarking. That program was carried out without competition or interference from private or foreign sources, thanks to the prohibitive tax. The surplus supplies of silver in all quarters of the globe were bought up by the Treasury and now rest securely in its vaults. Although the silver purchase statutes remain on the books, the Treasury has bought no silver under the 1934 Act since 1941 nor is there the slightest evidence today that it intends to resume such purchases.

While we are not suggesting that the silver purchase laws be repealed, we do strongly urge the repeal of the

silver tax on the grounds that it produces less revenue than what it costs the government and industry to collect it; that the tax is a nuisance to industry; that foreigners have no trouble in circumventing it, although the circumvention adds to the cost of doing business; that the tax no longer is of any value to the Treasury Department in carrying out U.S. monetary laws; that the continuance of the tax deprives American silver producers and consumers of the benefits of a readily available place to insure themselves against the risks of price fluctuations and their effects on inventories; and that this country's inability to restore a silver futures market plays into the hands of competing markets abroad.

We should welcome an early examination of the silver tax by your committee.

Yours very truly,
COMMODITY EXCHANGE, INC.
William Reid
President

In a special statement to this writer the Commodity Exchange president stated that the silver tax is "discriminatory and punitive and effectively bars a free market in silver on this or any other American exchange." Its repeal, he added, would "in the long run increase Government revenues through income tax on such trading profits and commissions as might be realized." Mr. Reid stressed that the tax problem can be solved without necessarily involving any other silver legislation.

Producers Support Idea

Typical silver producers consulted by the writer favor revival of a silver futures market. In discussing the subject in its annual report for 1952 the American Metal Co., which is both a producer and trader, observed:

More than any other factor the 50% tax on silver profits, levied in addition to regular income and excess profits taxes, prevents the development of a healthy market in foreign silver. Originally imposed under the Silver Purchase Act of 1934, this tax was intended not as a revenue measure but to protect the Governme.' against American speculators in its purchases of foreign silver under that act. That purchase policy seems finally to have been abandoned as the Government has purchased no foreign silver under the act since 1941. Nevertheless, this discriminatory tax remains in force to the detriment of producers, consumers, refiners and distributors. It is to be hoped that this tax will soon be repealed and that the expense, time, and effort presently devoted by the Government to its enforcement and by industry to compliance may be freed for more constructive purposes.

The company's treasurer, Hans A. Vogelstein, supplements the foregoing with the observation that during the past decade revenue from the silver tax has averaged less than $300,000 per annum and in 1952 was less than $100,000 and that, the tax being deductible as a business expense, the amount of net revenue which actually reached the Treasury was less than half these figures. Cost of collection, Mr. Vogelstein thinks, may exceed the revenue collected. Moreover the cost of the tax in industrial administrative expense tends to lessen industrial income subject to corporation taxes.

Considering the changes in the demand and supply situation affecting silver today, as compared with 1934 when the silver tax was enacted, Mr. Vogelstein holds the view that statistically silver would be able to support itself without Government intervention; and, if Government intervention is not needed, neither is there need of a tax to protect the Government from the effects of speculative trading. On the assumptions that the U. S. Treasury would not be a seller of silver and that it would supply its current subsidiary coinage needs from the remaining "free silver" in its General Account or by purchases in the open market (and not by melting standard silver dollars or bar silver now held behind silver certificates). Mr. Vogelstein thinks the silver market is in a strong position. Even complete repeal of all silver purchase laws—something he does not advocate—would in Mr. Vogelstein's view be more bullish than bearish.

"Today, under the 1946 statute, the Treasury is obligated to buy all newly-mined domestic silver offered to it at 90½¢ per oz. The same statute authorizes the Treasury to sell silver to industrial users. In practice the Treasury uses the 90½¢ purchase price as the basis for its selling price. So long as the Treasury has silver to sell, this practice acts as a ceiling. If the statute were repealed and the Treasury lost its authority to sell silver, the ceiling would disappear and the price of silver would be free to move upward."*

The American Smelting and Refining Co. is another which would like to see the silver tax repealed without disturbance to the silver purchase laws. Simon D. Strauss, vice president and sales manager, commented to the writer as follows:

The 50% tax on silver trading profits is an anachronism under present market conditions. No other commodity is subject to a similar discriminatory tax.

When this tax was originally enacted the Treasury was an active buyer of silver in the open market. The tax was intended to prevent speculative profits in silver for resale to the Government. Actually, between 1933 and the outbreak of World War II the Treasury's purchasing policy was the principal factor in determining the price of silver and those in a position to obtain information regarding the Government's policy would have been able to reap large speculative profits.

Since the end of the war the U.S. Government has limited its purchase of silver to metal of domestic origin and the world market has been determined by the normal operation of the forces of supply and demand.

Moreover, when this legislation was enacted corporate and personal income taxes were far below the levels that prevail today. The present high rate of income taxation is in itself an active deterrent to outright speculation in silver.

The 50% silver tax has not yielded any substantial revenue . . . in recent years the cost of its enforcement, both to the Government and to private industry, has probably been much greater than this revenue. Silver producers and consumers are prevented from engaging in normal hedging transactions.

For all these reasons we believe the tax should be abolished.

A far western mining viewpoint on restoration of silver futures trading through repeal of the tax is given by R. M. Hardy, president of the Sunshine Mining Co., who states:

Free trading on silver on the New York market would no doubt stimulate renewed interest in the metal. If sufficient interest is manifested through futures trading it is conceivable that the market price of silver might be improved. Such trading would no doubt cause fluctuations that have not been in evidence for many years.

In order to attract speculators to free trading in silver it would be necessary to repeal the 50% tax provision of the Silver Purchase Act of 1934. However, because of the desirability of retaining other more important provisions of the act, the repeal of this law in its entirety would be objectionable. This act contains a monetary provision that is basic in that it establishes a dollar ratio of silver to gold of one to three. It also sets a limit of $1.29 an ounce as the top price which the U.S. Treasury may pay for silver.

I would therefore have no objection to the repeal of the tax provision of

* Space is lacking here to discuss the Treasury's power to sell "silver ordinary" as was done during the war, to examine the dwindling Treasury stocks of "free silver", or to speculate on the bearing of any future returns of lend-lease silver on this question.

the Silver Purchase Act of 1934, and favor the resumption of free trading in the open market.

Americans Are Penalized

Until the outbreak of World War II the London market provided hedging facilities for silver producers and consumers in the dollar area, but these facilities were ended by the currency restrictions of 1939. The market price of silver normally fluctuates in response to demand and supply. Since World War II it has advanced about 45¢ to above 90¢, declined to 60¢, risen again to 90¢ and then fluctuated between that level and about 71¢. During this entire period—advocates of tax repeal point out—producers and consumers have been deprived of an opportunity to protect their operations against inventory losses.

American-controlled mining subsidiaries in Canada and Mexico likewise have lacked a market where future production can be hedged in dollars.

The Silver Users' Views

The principal silver users take the position that if anything is to be repealed it should be the whole silver purchase program as related to both foreign and domestic newly-mined metal. Baker and Co. "feel that the 50% profits tax repeal would save a lot of work in reporting silver transactions, but other than the paper work involved we are not affected by this law." A visit to Handy and Harman, silver dealers and fabricators, elicited the statement that the silver tax is a nuisance to the firm, but nothing more. Handy and Harman, now dues-paying members of the Silver Users Association, declare themselves as in agreement with the objectives of that association.

Speaking for the Silver Users Association Admiral Donald J. Ramsey (Ret.), the legislative counsel in Washington, gave the writer the following statement:

With reference to the question of repeal of the provisions of Section 8 of the Silver Purchase Act of 1934, providing for a tax of 50% on the transfer of any interests in silver bullion under certain conditions, the position taken by the Silver Users Association is that the entire Silver Purchase Act of 1934 together with section 4 of the Act of July 6, 1939, and the Act of July 31, 1946, must be repealed. The objective of the Silver Users Association, briefly, is a free and open market for silver operating under the ordinary laws of supply and demand. Consideration of all the factors involved in the present silver situation indicates that repeal of Section 8 of the Silver Purchase Act of 1934, providing for a tax of 50%, etc. . . . will not accomplish the objectives of the Silver Users Association. Therefore the position of the Silver Users Association is that the entire Silver Purchase Act of 1934 must be repealed, together with such other laws or portions of laws which prevent a free and open market for silver.

Opposition of the silver users, it may be noted, defeated the efforts made in 1945-46 to get the tax repealed.

Handy & Harman's Views

Although Handy & Harman, whose eminent position in the silver trade is attested by the fact that the firm determines the daily "official price" of silver used in settling smelters' accounts with miners, today align themselves with the silver users position on tax repeal, in June 1947 they filed a letter with the Ways and Means Committee which comprises a 10-page pamphlet appealing for repeal of the silver tax. The letter gave detailed reasons why the original justification of the tax no longer applied, why the tax was more punitive than revenue-raising, why it was discriminatory and prevented hedging by industry while causing "burdensome and costly" record-keeping and reporting, and why repeal of the tax was necessary for the establishment of a normal commercial silver market.

The letter outlined the history of the development of the American silver market as a result of World War I and that market's attainment of parity with the London silver market by the early 1930s. Then, the letter related, the National Metal Exchange opened silver trading, with the result that ultimately there was considerable public speculation in the market. Handy and Harman continued: "There is little reason to expect that any important part of the world silver business can or will return to the United States without elimination of the tax . . . This statement represents not only the opinion of silver dealers within the United States, but also that of foreigners, who are forced to prove, in each transaction with United States buyers, that no tax is due, or that if due it has been paid . . . Many sellers in other countries who normally would look to buyers in the United States have ceased to do so and have transacted their business elsewhere . . . If the United States is to regain its share of this world business, a normal commercial market must be re-established in this country. Restoration of such a market will make a valuable contribution to national income in the form of additional smelting, refining, marketing, manufacturing, trucking and similar earnings. It will . . . serve to eliminate many price risks which the silver industry is presently compelled to take because of the current lack of normal market facilities."

If these arguments made by Handy and Harman in 1947 were valid then, nothing that has happened since comes to mind which would render them any less applicable to the present.

The Government's Position

Throughout the Roosevelt and Truman administrations the Treasury opposed repeal of the silver tax without repeal of the Silver Purchase Act of 1934. The position of the Treasury under Secretary Humphrey appears not yet to have been formulated for the obvious reason that it has not had to take a public position in the matter and has enough problems as it is. To the writer a Treasury spokesman merely observed: "The new Treasury has taken no position as to repeal of the silver tax."

The position of the previous administration was set forth in a report prepared by the staff of the Joint Committee on Internal Revenue Taxation in 1947 incident to an examination of the brief filed with the Congress by Handy and Harman mentioned above. "To permit the resumption of speculation while the Treasury is required to purchase silver would result in speculation related to the Government's purchases and would increase the cost of the Government's silver purchases," the staff reported.

The staff report admitted the normal useful role played in a market by speculators who assume risks otherwise borne by producers and consumers; but it found speculation objectionable so long as the Treasury is or again may become a buyer. That the tax is not a revenue producer the administration felt was no argument against it; the tax never was intended to be a revenue producer.

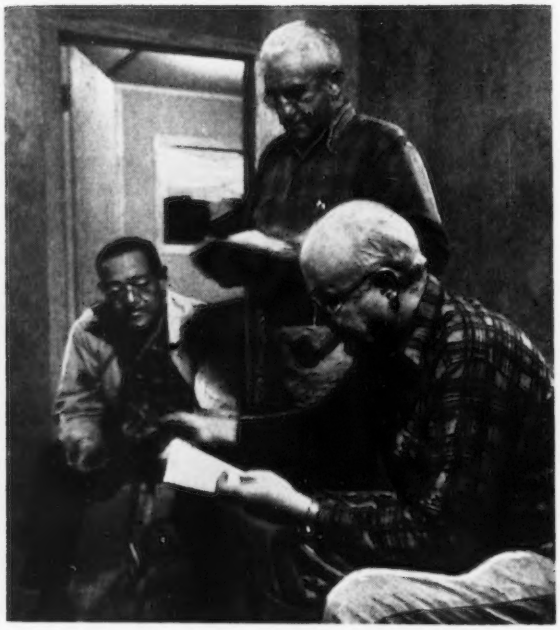
The argument that the tax is discriminatory because it prevents fabricators from hedging was rejected on the grounds that the Treasury regulations are so liberal as to make ordinary hedging relatively unim-

(Continued on page 162)

Railroad Nearing Labrador Iron Ore

Hanna-Hollinger presses construction of 360-mile line and other necessary facilities, with 1954 as target for production by IOC

STEEL RAILS of Labrador's 360-mile ore road are pushing northward one and a quarter miles every day.



J. H. THOMPSON, right, M. A. Hanna president, checks progress at Milepost 224 with CMMK engineer, standing.

SINGLE-TRACK ORE ROAD will have mile-long sidings 17 miles apart to speed travel of 11,000-ton payload trains to Seven Islands. Specially designed cars will have 36-in. wheels to permit 97-ton maximum load capacity.

CONSTRUCTION of Quebec, North Shore & Labrador Railway by Iron Ore Company of Canada under Hollinger-Hanna management commands the spotlight because the remoteness of the deposits necessitates adequate means of getting the ore down to the St. Lawrence where it may be loaded into carriers. Without such transportation the deposits might as well be on the moon, so far as utilization is concerned. By the time the task is done, the four contracting companies, known as CMMK for short, which were awarded the job on a joint bid, will have skirted many lakes, driven two tunnels, carved a roadbed out of vertical rock walls in places, built bridges, and conquered miles of muskeg over the 360-mile northbound course through bleak, barren, uninhabited territory. Facilities for loading ships, housing employees, and generating power are also being provided. *Continued on following page.*

Facts by R. E. Cochran, McGraw-Hill Cleveland Office. Photos by Bob Isear, Business Week

AN INNOVATION in laying track—When rails on car are laid, car is lifted off to one side and another carload of rails brought up. Cars are put back on track when rail train returns to supply yard at end of work day.

TRACK IS BEING SURFACED by track foreman, while track gang waits, to make it even along length of rail, whether level or inclined. This task requires considerable skill which is developed through long experience.

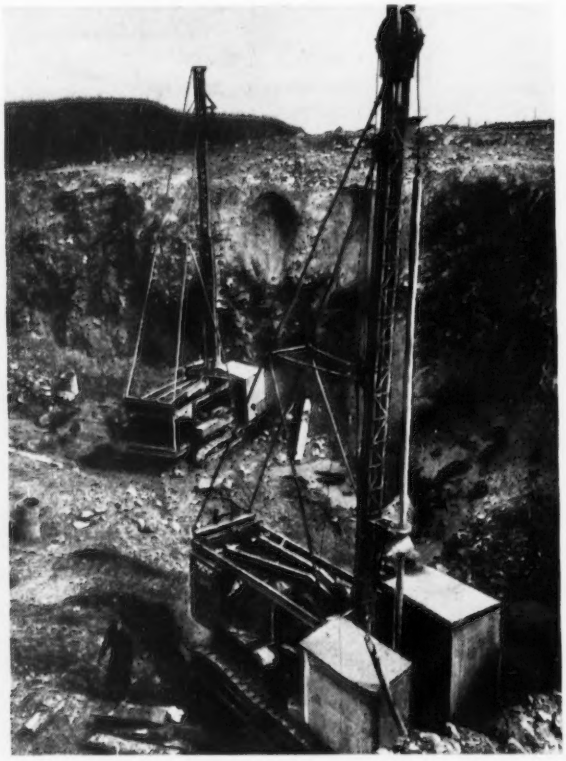
Other facilities are provided ➡

Besides Labrador railroad, other facilities are needed

Continued from preceding page

WHEN MINING BEGINS, sometime next year, three pits will be opened on Ruth Lake, Ferriman and Burnt Creek deposits near Knob Lake railhead, where spur lines can easily be built. For each a screening plant will be provided. Meanwhile CMMK, with 6,000 men and about $13-million worth of equipment, is striving, at Iron Ore Company's urging, to reach Milepost 330 before winter shuts down outdoor construction work.

POWER SHOVEL is being used, with trucks, by grading crew working from Knob Lake south to Menihek dam.



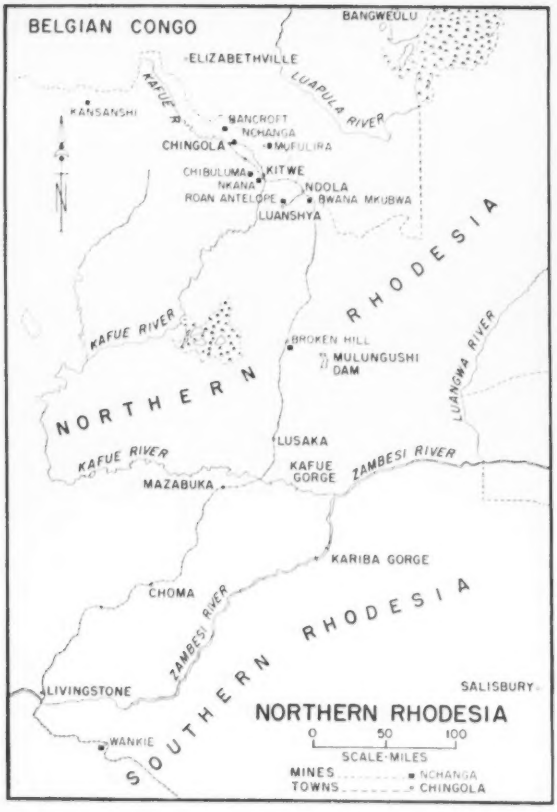
CHURN DRILLS are drilling blast holes for plant footings, and will be used for further exploration and mining.

MARGUERITE RIVER DAM will furnish water for 25,000-hp. plant to supply power for Seven Islands installations, including townsite. Gulf Power Co. is collaborating. Piers 192 ft. high will back up water 36 miles.

AIRLIFT of subsidiary Hollinger Ungava Transport Co. has played and still plays important part in delivering men, equipment and supplies to desired points. Typical of pilots on line is man in foreground.

LINING UP FOR CHOW at camp car, project employees show eagerness to eat. Some 6,000 are now on payroll.

FIELD SURVEYS must show what part of concessions will be kept for mining, also where provincial boundary lies.



H. L. TALBOT F. H. CHAPMAN

Kitwe, Northern Rhodesia, Africa

Authors Talbot and Chapman are consulting metallurgist and assistant consulting metallurgist, respectively for Anglo American Corporation of South Africa, Ltd., Kitwe, Northern Rhodesia. They have been closely associated with development of the electrolytic cobalt process described in this article.

How Northern Rhodesia Meets Rising Base Metal Demands

HIGHLIGHTS of the fabulous Copperbelt story were presented by Messrs. Talbot and Chapman in the July, 1953 issue of *E&MJ*—"Mining's Greatest Era." Significant facts are repeated here in brief, followed by detailed accounts of the metallurgical projects now under way in the area.

Northern Rhodesia's giant metal mining industry has made great strides since ore was first discovered in the area in the late twenties. In 1953, mineral production in the territory exceeded £79-million, 99% of which was for copper, zinc, lead, and cobalt, in that order of importance. Industry employment totaled some 6,000 European workers, and 42,000 Africans.

Copper is produced by four large mining companies: Rhokana Corp., Ltd., Nchanga Consolidated Copper mines, Ltd., Roan Antelope Copper Mines, Ltd., and Mufulira Copper Mines, Ltd. In 1952 these operations produced 350,000 short tons of copper as electrolytic shapes and blister.

Northern Rhodesia, world's third largest copper producing country, still has great potential for expansion. Two new mines are preparing for production; five new prospecting companies are active; and the previously known properties of Baluba and Kansanshi are being explored.

Chibuluma, controlled by Mulfulira, is scheduled to become a fifth producer late in 1955. Production will total about 19,000 short tons of copper per year from ore reserves presently proved at 7.3-million tons averaging 5.23% copper. Underground development is proceeding rapidly, mine buildings are under construction, and a new concentrator will be built.

Intense activity surrounds a sixth major project to develop the Kirila Bomwe and Konkola orebodies of Rhokana situated several miles apart near the Belgian Congo border. Drilling has delimited combined reserves of about 80-million tons of ore averaging 3.6% copper. Shaft sinking is under way at both properties and a townsite at Kirila Bomwe is well advanced. A concentrator will be constructed at Kirila to serve both properties. Production will start in about five years at an annual rate of 48,000 short tons of copper. This new producer will be called the Bancroft mine in honor of Dr. J. A. Bancroft, Canadian geologist who has contributed so much toward Copperbelt development.

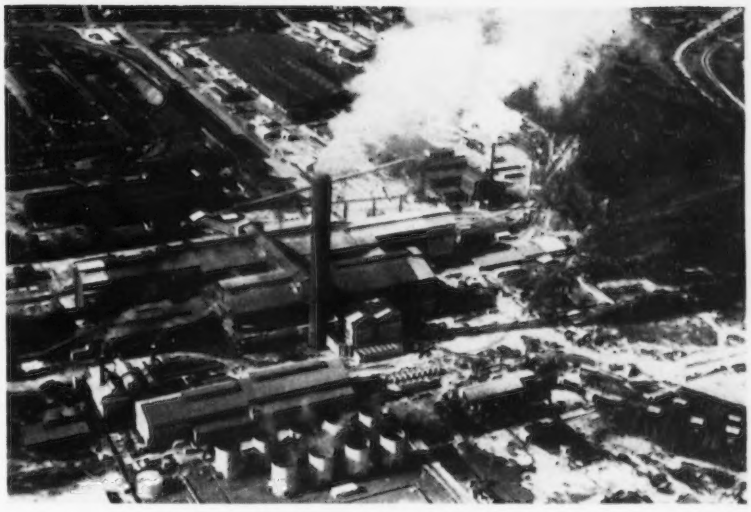
Recently published ore reserves of active and scheduled producers in the Copperbelt total more than 600-million tons of proven ore, averaging 3.7% copper—or about 20-million short tons of the red metal.

The Copperbelt boasts four large flotation concentrators, with an an-

nual total milling capacity of some 15-million tons of ore. Of the three conventional reverberatory smelting plants in the area, Rhokana's plant with a capacity of 16,000 short tons of copper per month is the largest. Its capacity will eventually be increased by about 25% to handle concentrates from Rhokana, Nchanga, and Bancroft.

There are two electrolytic copper refineries in the territory. In 1951 the Rhodesia Copper Refineries plant at Nkana, jointly owned by Rhokana and Nchanga, increased its annual capacity to 140,000 short tons per year. Tankhouse facilities were doubled, and a third rotary anode furnace and Walker-type casting wheel were installed, also a 300-ton wirebar furnace. An electric furnace for cathode melting is under construction.

Mufulira started up its first anode and tankhouse unit in 1952; by 1955 a second unit is scheduled to operate, and cathode melting with casting facilities will be added for a total annual capacity of 80,000 short tons of refined copper shapes.



RHOKANA'S COPPER SMELTER includes a new electrolytic plant (center background) and a new cobalt plant (with stack center right).

Unusual Metallurgical Problems

At Nchanga Consolidated Copper Mines rich ore of the Nchanga West orebody presented unusual metallurgical problems requiring an ingenious approach for solution. Here the sulphide and oxide copper minerals (principally chalcocite and malachite) were intimately associated throughout the orebody. The most economical approach proved to be a selective flotation process yielding a "sulphide" concentrate for smelting followed by an "oxide" concentrate for acid leaching with electrolytic recovery.

Expansion of Nchanga's mining and concentrating plant to a milling rate of 180,000 tons of ore per month has been paralleled by construction of a leach plant with nominal capacity of 2,200 short tons of cathode copper per month. By the end of 1953 further overall mining and plant extensions will increase Nchanga's productive capacity to about 120,000 short tons of copper per year, of which 40,000 tons will be leach plant potential. Integrated with Nchanga's leach plant is a 50-ton per day contact sulphuric acid plant at Nkana. A second unit is under construction.

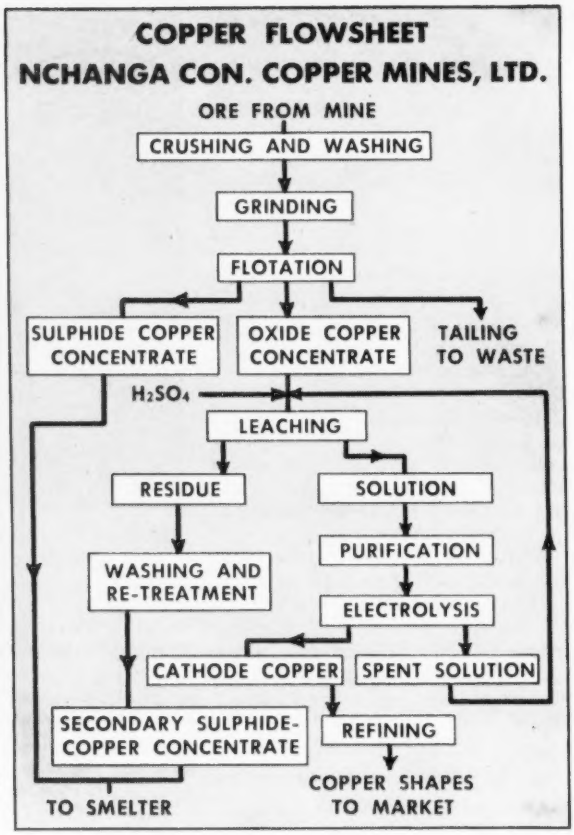
Nchanga leach grade concentrate containing some 20% copper of which 16% is acid soluble and 4% sulphide copper, is reclaimed from bedding bins continuously and mixed with spent electrolyte in repulping tanks. Rapid dissolution of the oxide copper is completed in a series of mechanical agitators, and the strong solution separated in 80-ft. thickeners. Overflow is clarified and copper recovered electrolytically. Underflow is washed by counter current decantation, and the final residue retreated in the flotation plant for recovery of sulphide copper. The diagram on page 84 shows a generalized flow in treatment of Nchanga ore.

Cobalt

Cobalt, which occurs to the extent of about 0.15% in Rhokana copper ore, was produced in 1952 to the value of over £1-million. Though this represented only 1.3% of the total value of Northern Rhodesia's mineral production, a revolution is taking place in cobalt production which will bear watching.

For many years, cobalt has been produced by Rhokana on a moderate scale as a by-product of copper, in the form of high-grade alloy with iron and copper, which has been refined to cobalt metal or oxides overseas. Selective flotation of Rhokana ore yields a primary copper concentrate, and a secondary or so called "cobalt" concentrate assaying approximately 3.5% cobalt, 25% copper, and 17% iron. Until recently, the cobalt concentrate has been subjected to separate reverberatory matte smelting to recover copper in the conventional manner and to concentrate cobalt values in converter slag which is granulated and reduced with coke in electric arc furnaces. The process, while successful and responsible for Northern Rhodesia being the world's second largest cobalt producer, has not been efficient or flexible.

Following years of local research and development, a new plant for production of high-quality electrolytic cobalt was commissioned in 1952 and eventually the older alloy process will be replaced completely. The new plant is in successful commercial operation, and the rate of production is steadily increasing as the usual starting-up difficulties are overcome. At present, the old and new processes are operating simultaneously, at a combined production rate equivalent to about 2-million lb. of refined cobalt annually. When the marked advantages of the new process are realized at the full scheduled rate and alloy production ceases, a much larger output of this strategic metal is anticipated. Following this achievement in concentrate processing, attention was directed to improvement in selective concentration of the ore; a major development now awaiting completion of pilot plant confirmation promises greatly enhanced recovery and grade of cobalt in the concentration phase. This will ultimately be reflected in further increase of output. New metallurgical techniques have recently focused attention upon vast accumulated tonnages of Rhokana reverberatory slag in which cobalt occurs in small but significant amounts. These were previously considered as waste. Payable values of cobalt occur in other orebodies of the district, and



NCHANGA'S PLANTS include leaching and electrolytic section (front), headframe and concentrator (rear). Flowsheet (right) shows unusual metallurgy involved.

will undoubtedly contribute to the productive potential. This is definitely the case for the Chibuluma where the copper orebody contains some 0.25% cobalt and an annual production of 500,000 lb. of cobalt is scheduled.

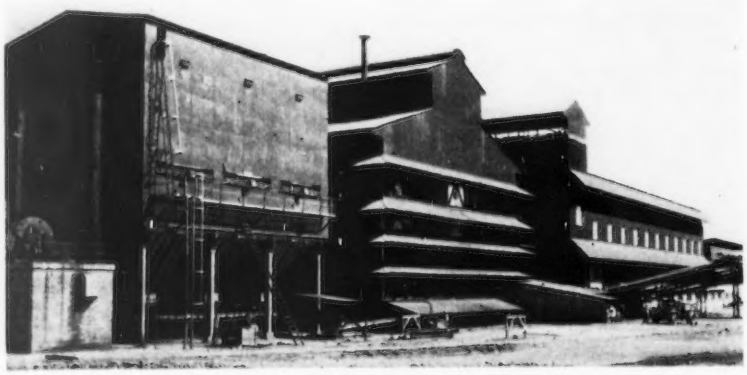
In Rhokana's electrolytic cobalt plant (see flowsheet) filtered cobalt concentrates are given a stage sulphatizing roast in six 8-hearth Nichols-Herreshoff furnaces, downdrafted. The objective is to convert the cobalt to water soluble sulphate, while copper and iron are oxidized to insoluble compounds as completely as possible.

The calcine, together with flue dust recovered from an electrostatic precipitator, are conveyed to the continuous leaching system in which soluble cobalt is extracted with hot water. The leached pulp is filtered in two stages with Eimco rotary vacuum filters of stainless steel, and the cake of residue containing more than 20% copper in oxidized form provides part of the charge to the copper smelter.

The cobalt filtrate, with wash solutions, is pumped to a series of purification agitators where iron and most of the copper are precipitated by aeration and addition of milk of lime with careful pH control. The partially purified cobalt solution is separated in a 40-ft. thickener, the overflow from which is pumped to cascades of cementation cells, where final traces of copper are removed in contact with metallic cobalt granules.

Cobalt is then completely precipitated from the purified solution as hydroxide by agitation with milk of lime, and the waste water separated in a second 40-ft. thickener, followed by filtration of the underflow on Eimco rotary filters.

The cobalt hydroxide filter cake is mixed with spent acid electrolyte, make up sulphuric acid is added, and the cobalt dissolved in a series of mechanically agitated tanks with careful pH control. The residue from this redissolving step is separated in a 50-ft. thickener, the underflow from which, together with residue from the iron-copper purification is retreated to recover the



RHOKANA'S NEW COBALT PLANT includes dust precipitator (left), roasting section (center), leaching and electrolytic section (right). See flowsheet of the new cobalt plant on page 85. ➤

remaining cobalt values contained.

Overflow from the 50-ft. thickener is cobalt feed electrolyte which is passed through stainless steel heat exchangers to raise the temperature to 60 deg. C. before distribution from steady head tanks to the individual lead lined electrolytic cells. Two 32-cell units are installed and are served by two 360-kw. motor-generator sets. Each cell contains 12 mild steel cathode plates and 13 antimonial lead anodes. A cathode current density of 15-amp. per sq. ft. is applied. Excellent cathode deposits are produced with a current efficiency exceeding 80%. Spent electrolyte, now acid, recycles to dissolve cobalt hydroxide cake, and to replenish the cobalt tenor of approximately 35 g. per liter.

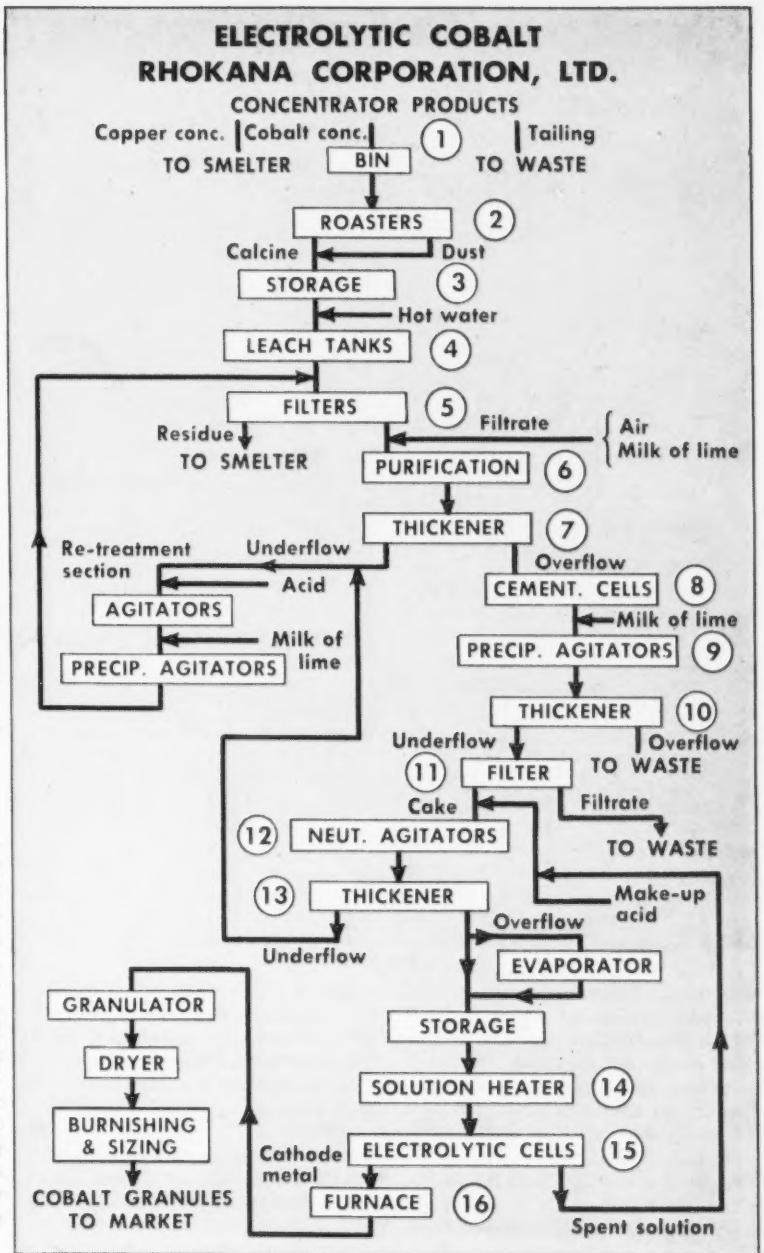
Cathode cobalt, after thorough washing, is stripped from the steel blanks and sent forward for melting and final refining in a 3-ton Lectromelt furnace. The metal is granulated in water under carefully regulated conditions. The high purity granules are dried, polished in rotary burnishing drums, screened, and packed in steel drums for shipment.

Lead and Zinc

While now attracting less attention than the powerful copper industry, the stable, integrated economy of lead-zinc-vanadium operations of Rhodesia Broken Hill Development Co., Ltd., is, in fact, the outgrowth of the first large-scale mining venture in Northern Rhodesia. Lead smelting commenced as early as 1917 at Broken Hill, but it was not until 1928 that commercial production of electrolytic zinc was achieved. The Broken Hill ores are indescribably complex and the progressive development of successful metallurgical processes for their treatment is in itself a real tribute to the pioneer metallurgists.

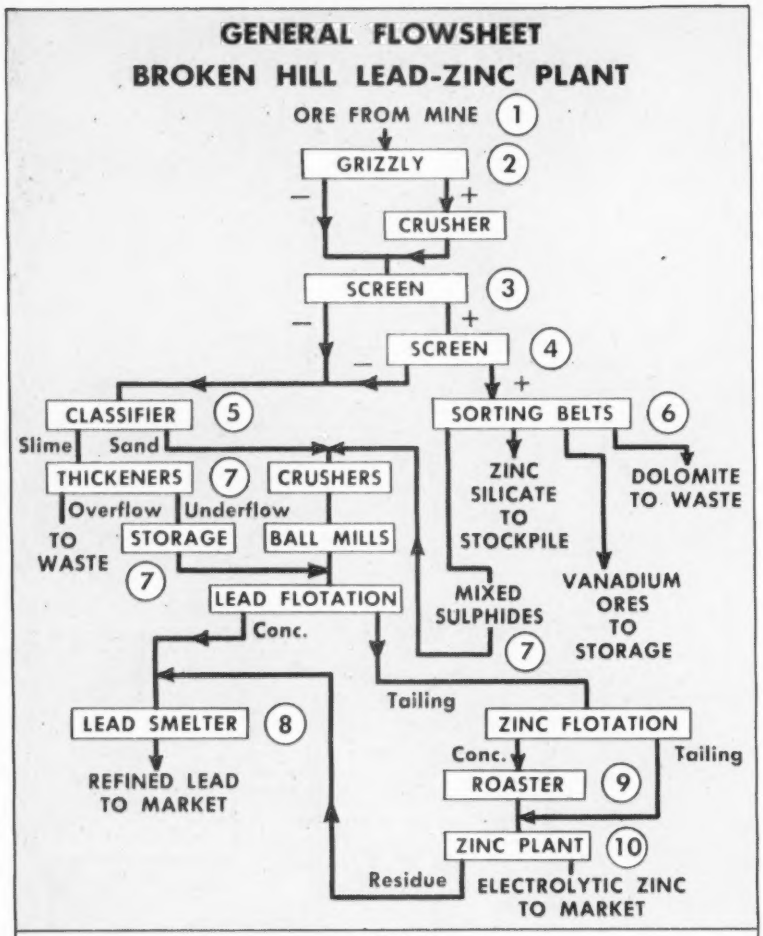
In 1952, Northern Rhodesia produced 14,122 short tons refined lead, valued at £1,740,500 and accounting for 2.2% of the total value of the mineral output of the territory. Corresponding figures for electrolytic zinc were 25,637 short tons valued at £3,792,975 or 4.8% of total mineral value. These production values arose entirely from operations at Broken Hill.

With considerable over-simplification which gives only a partial clue to the complex nature of the operations involved, the accompanying diagram indicates the general flow in treatment of the very high grade Broken Hill ores. The present



LEGEND

1. Cobalt concentrate assays about 3.5% cobalt, 25% copper, and 17% iron.
2. Stage sulphatizing roast in six 8-hearth Nichols furnaces, down-draft.
3. Electrostatic precipitator for dust recovery.
4. Continuous leaching with hot water.
5. Two-stage filtration on stainless steel Eimco filters. Cake carries over 20% copper.
6. Agitators for purifying solutions by aeration with milk of lime.
7. Thickener, 40-ft.
8. Cascades of cementation cells, final traces copper removed by passing over cobalt granules.
9. Cobalt completely precipitated as hydroxide by agitation with milk of lime.
10. Thickener, 40-ft.
11. Eimco filters.
12. Mechanically-agitated tanks, careful pH control.
13. Thickener, 50-ft.
14. Stainless steel heat exchangers, temperature to 60 deg. C.
15. Two units, each 32 cells, 12 mild steel cathodes, 13 antimonial lead anodes (see text).
16. Lectromelt furnace, 3-ton.



LEGEND

1. Broken Hill's ore is extremely complex, including both sulphide and oxide lead and zinc minerals (see text).
2. Grizzly, 4½-in. spacing.
3. Double-deck screen at ⅛-in.
4. Double-deck screen at plus 3-in.; plus 1-in., minus 3-in.; and minus 1-in.
5. Spiral-type classifier.
6. Hand-sorting belts yield the products noted.
7. The three products marked 7 are treated through the flotation plant separately and at different times.
8. New lead smelter being built to treat current lead sulphide output plus collected zinc plant residues.
9. Sulphide zinc concentrate given a suspension roast.
10. Zinc flotation tailing is high in oxide lead and zinc, provides direct feed for zinc leach, residue goes to new lead smelter.

economy is based upon the separation of sulphide lead and zinc concentrates by selective flotation, the tailings high in oxidized lead and zinc values providing a direct feed to zinc leaching, accompanied by calcine from suspension roasting of the sulphide zinc concentrate. Sulphur dioxide gases from the roasting are the source of chamber plant sulphuric acid, required for zinc and vanadium leaching operations.

Until recently, lead production was derived principally from high grade sulphide lead concentrates which were smelted in Newman hearths and the by-products treated in a small cupola type blast furnace. A simple refining treatment followed, to produce undesilverized lead. Now a completely new and modern lead smelter is in the course of commissioning, the main purpose of which is to utilize large tonnages of accumulated lead bearing residue from electrolytic zinc operations, as well as the current production of lead sulphide concentrates. The new plant includes an elaborate charge proportioning and mixing system, the clayey nature of the wet zinc residue presenting an unusually difficult problem. The mixed charge passes through rotary pelletizers to sintering machines of the Dwight-Lloyd type, provided with long hoods for ignition of the low sulphur feed by producer gas. One large modern blast furnace is provided for smelting the low lead sinter, and special facilities are installed for handling and cleaning the large slag fall ahead of the slag granulating system.

Independently of this development, plans have now been completed to extend the lead refinery to include desilverization by the Parkes process followed by vacuum dezincking. The new lead smelter and the refinery extension will not increase overall production of lead substantially, but are long term measures for well rounded economy.

The electrolytic zinc plant at Broken Hill has recently been extended for a 25% increase in output, but the extension is only partially in commission pending the installation of a mercury arc rectifier. This expansion will utilize large surface stocks of zinciferous products and will not affect the basic mining rate.

Miscellaneous Metals

Vanadium, occurring in the Broken Hill ores, has been produced intermittently by acid leaching of selected products and precipitation of vanadic hydrate, which is processed to high-grade fused oxide. New approaches in concentration of vanadium values from low grade products may result in stabilized production of vanadium in the future.

Cadmium, a by-product of electrolytic zinc, has been accumulated for many years as a purification residue at Broken Hill. Though the current increment represents only a small annual tonnage of cadmium, it is nevertheless significant. A plant is now under construction for producing refined cadmium from current and accumulated residues, by acid leaching, purification, and precipitation of high grade sponge which will be melted, refined by distillation and cast into market shapes of highest quality.

World-wide interest in uranium has prompted geological reconnaissance in Northern Rhodesia, and some occurrences of radioactive elements have been disclosed. Particular interest is focused upon a deposit at the south end of the Mindola section of the Nkana Mine. Small tonnages of uranium ore have been proved, and exploration is continuing to delimit the orebody and

to determine its economic merit. Investigation into methods of concentration and extraction has begun.

Precious metals are not prominent in the Northern Rhodesia economy, but significant values in gold and silver, as well as selenium are recovered in anode slimes from the electrolytic copper refineries. The slimes, up to the present, have been shipped overseas for refining, as the tonnage is not large.

Research in the Mineral Industry

It will be evident from this brief story of expansion that applied research and development has played no small part in the present structure of the territory's mining industry. Surprisingly complex problems of ore treatment, base metal extraction, and refining have been solved by skilled research minds with modest facilities. Many problems remain, not only as new mines are born, but in constant improvement of existing plants and practices and in the treatment of certain refractory ores available in large tonnages awaiting new approaches to release their values.

In recognition of past accomplishments and future needs, the central research and development services for the group interests represented by Rhodesian Anglo American Ltd. have been reorganized and expanded. Large, modern, fully equipped laboratories for basic research and an administration building including a technical library are under construction at Nkana in a parkland setting. For larger scale development, an all-purpose pilot plant of steel construction is nearing completion at another site in Nkana, with access by rail spur and road. Complete permanent facilities have been installed for receiving, crushing and grinding. By use of removable platforms attached to the structural columns, all types of unit operations can be assembled for the investigation, on a continuous basis, of problems involving concentration, leaching and electrolysis. Facilities for pyrometallurgical operations such as roasting or electric smelting are also provided. Adjacent to the pilot building is a well-equipped metallurgical laboratory which serves the pilot operations, containing facilities for sample preparation and storage, assaying, and small scale metallurgical testing.

All these physical facilities for research and development, provided at great expense, would be of little value without effective manpower. An efficient staff of approximately 40, most of them technically trained, and headed by a director of research, has been carefully selected to achieve the necessary pooling of diversified qualifications for effective team work in the solution of problems. The staff does not confine its activities to the laboratory, but enjoys active liaison with operating personnel in the plants of the group where development problems receive much attention.

EXPLORATION CAMP AT KIRILA BOMWE (Place of the Croaking Frogs) is the base of operations where systematic drilling has delimited millions of tons of 3.6% copper ore.

Energy Resources

Fuel and power demands of the territory have grown rapidly in the past few years and the situation has become critical in view of current broad expansion in the mining industry and more developments to mature in the near future. With the exception of the Broken Hill operations, whose power needs are supplied by its own hydroelectric plant at Mulungushi, the economy of the mining industry of Northern Rhodesia presently rests on thermal power stations. Coal production from the very large resources of the Wankie Colliery, 500 rail miles distant from the Copperbelt, has increased but has not kept pace with recent demands. Rail transport has also been a bottleneck. Despite extensive practice of cordwood burning in Dutch ovens and the use of wood gas producers, for steam raising, the copper producers meet with recurrent fuel shortages necessitating frequent curtailment of operations.

Active measures have been taken to alleviate and finally to surmount this difficulty. The four copper mining companies in 1948 decided to embark upon a scheme for interconnecting their individual mine generating stations by a high-voltage grid system and to centralize additional installation of boilers and turbo-generators. The first phase of this program was completed by the Northern Rhodesia Power Corp. in August 1952 when the transmission system was commissioned and a pool of generating capacity established. The system is controlled through a central switching station at Nkana. Expansion in generating capacity is centered at Nchanga, which will have a capacity of nearly 100,000 kw. by 1956.

The interconnection system has both short and long term objectives. Expensive spare equipment carried by each mine is reduced; power available may be shared in the fairest and most economical manner; power may be imported immediately by an individual mine in periods of emergency. For the long term, the grid system will provide the medium for import of bulk hydroelectric power from outside sources via the central switching station for distribution to consumers.

Negotiations have been completed for construction of a 320-mile 220,000-v. transmission line from a new hydroelectric station to be built in the Belgian Congo. Substantial blocks of power will be imported from this source by 1957. It is anticipated that combined resources of power will then be ample for the industry, including the two scheduled new mines, until much more ambitious plans materialize to harness the huge potentials of the Kafue Gorge or Kariga Gorge near the confluence of the Kafue and Zambezi rivers.

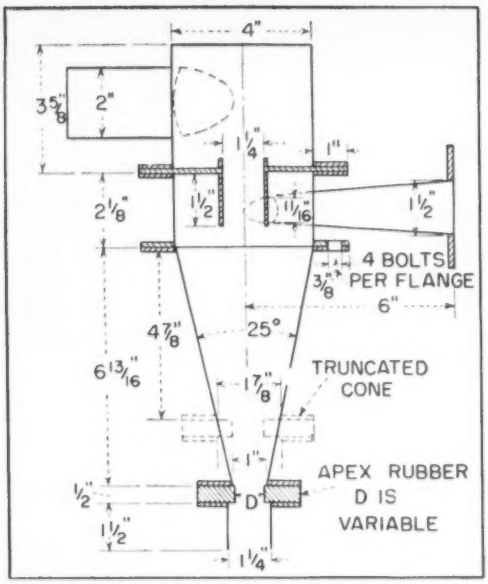


FIG. 1. THIS 4-IN. DSM CYCLONE SEPARATOR, sketched here to show its general dimensions, was built in Hibbing for the laboratory investigation described in this article.

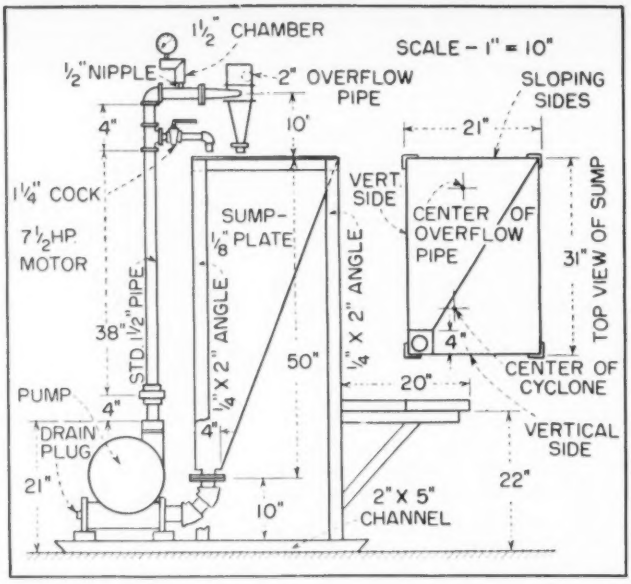


FIG. 2. FOR FEEDING 4-IN. CYCLONE batch test unit this arrangement of pump and sump was devised. Sump for pump that feeds cyclone must provide maximum suction head possible without excessive volume of medium.

Factors Affecting Ore Separations

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BENEFICIATION OF various ores by treatment in Dutch State Mines cyclone separators using magnetic medium is becoming increasingly important, particularly on the Mesabi. Plants are projected also for zinc-lead and manganese ores, and it is safe to say that the use of the process will spread.

Publication of data on cyclone ore separations is limited, but the article by S. E. Erickson and E. C. Herkenhoff, presented before the University of Minnesota Mining Symposium in Duluth in 1950, and published in *E&MJ*, June, 1950, described some results and the flowscheme used in pilot-plant work. This work led to full-scale operation in at least two plants, with others scheduled for operation in 1953.

Use of cyclones as classifiers and thickeners has been well described. However data on the many factors affecting ore separations where cyclones are used with magnetic medium are limited. The object of this paper is to present information on medium and ore flows when minus-¼-in. low-grade iron ores are treated in cyclone separators. Inasmuch as pilot-plant work on even a small scale calls for a bulky medium preparation and recovery section the test work was limited to batch tests using a 4-in. diameter cyclone. Batch tests, properly conducted, facilitate study of the numerous variables which affect cyclone ore separations and provide essential data required for plant layout and design.

Presented at University of Minnesota Mining Symposium, Duluth, Minn., January, 1953.

Cyclone Found Best for −¼-in. +65-Mesh Fraction

For those who are not familiar with the fields of concentration covered by the various processes now in use in the Lake Superior region, it may be well to point out that heavy-density separation, using ferrosilicon media, is generally used on lean ores in the size range of minus 1½-in. to minus 3/16-in. or ¼-in. The —¼-in. + 65-mesh fraction has been treated by several methods, including jigging, but the results have been relatively poor. Treatment of this fraction by the cyclone separator process has resulted in greatly improved recoveries.

In iron ore concentration, heavy-density separation employs a medium with a specific gravity range of 2.7 to 3.2 and separation is effected by the sinking or floating of the ore particles in this medium.

Cyclone separation generally employs a medium with a specific gravity range of 2.0 to 2.5, but makes an effective separation equivalent to that obtained at 2.8 to 3.0 using heavy liquids. The centrifugal and centripetal forces utilized by the cyclone separation are responsible for the effective separation, gravity being higher than the actual feed medium gravity. This will be apparent in the study of the forthcoming test results.

Four-Inch Cyclone Selected

For treating low-grade iron ores that are minus ¼-in. in top size, a 4-in. diameter DSM cyclone is about the minimum size that can be used. This size of cyclone normally employs an apex aperture of about 11/16-in. or ¾-in. diameter; inasmuch as the apex orifice may not be much smaller without causing choking by the ore particles, the minimum diameter of the cyclone, by predetermined proportion to the apex, becomes 4-in.

Of course, larger cyclone separ-

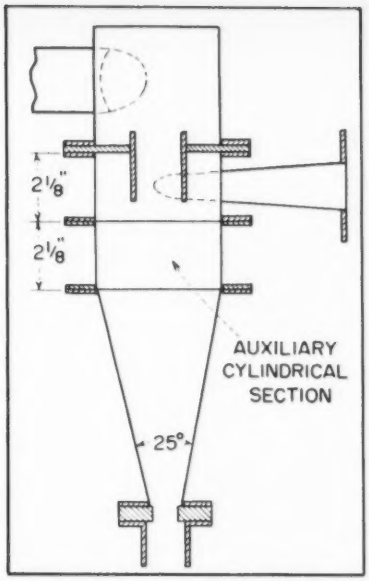


FIG. 3. AUXILIARY CYLINDRICAL SECTION 2⅛-in. high was inserted between cyclone inlet and conical section to study effect on medium flow.

TABLE 1—Capacities and Flow Splits with Water Only

Test No.	Cyclone Vortex, In.	Cyclone Apex, In.	Cyclone Cone	Feed Lb. Pressure	Feed Gpm	Overflow %	Underflow %
H-2	1	15/16	Tapered	15	22.3	61.87	38.13
H-1	1	11/16	Tapered	15	23.2	92.90	7.10
H-4	1	5/8	Tapered	15	19.9	97.66	2.34
H-3	1	7/16	Tapered	15	21.0	100.00	
H-6	1	15/16	Truncated	14½	20.0	71.15	28.85
H-5	1	¾	Truncated	15	20.3	86.87	13.13
H-7	1	½	Truncated	14½	19.7	97.18	2.82
H-11	1	15/16	Tapered	15	22.0	59.57	40.43
H-8	1	11/16	Tapered	15	21.0	90.70	9.30
H-9	1	5/8	Tapered	15	21.6	95.96	4.04
H-10	1	7/16	Tapered	15	21.1	100.00	
Tests H-8 through H-11: Cyclone had a 2⅛-in. auxiliary cylindrical section.							
H-1	1	11/16	Tapered	15	23.2	92.90	7.10
H-12	1¼	11/16	Tapered	14	22.6	99.18	0.82
H-13	1 9/16	11/16	Tapered	13	25.4	100.00	
H-14	2⅛	11/16	Tapered	12	27.0	100.00	

Note: In all tests the cyclone inlet nozzle was 11/16-in. in diameter.

in a 4-in. DSM Cyclone Separator

ators can be used, but these call for larger volumes of medium and correspondingly larger weights of ore sample. With the 4-in. cyclone separator here described, ore samples weighing from 25 to 30 lb. can be satisfactorily treated using ratios of ore to medium that must be employed in operating plants.

The 4-in. DSM cyclone separator is shown in a drawing (Fig. 1). This cyclone was built in Hibbing according to our design, as taken from prior Dutch State Mines cyclone dimensions supplied by the American Cyanamid Co.

Another drawing (Fig. 2) shows the arrangement of pump and sump for feeding the 4-in. cyclone. A 1-in. Wilfley pump driven by a 7½-hp. motor supplies feed to the cyclone. The sump design is important and must provide as much suction head for the pump as possible without requiring an excessive volume of medium.

Pump and sump arrangement, as shown, allow tests to be run with a medium charge of as little as 150 to 160 lb. At a 1-to-5 or 1-to-6 ratio of ore to medium, a 30-lb. ore sample can be treated. For laboratory testing the 4-in. cyclone, therefore, offers the advantages of minimizing the work involved in preparing the ore sample and medium slurry.

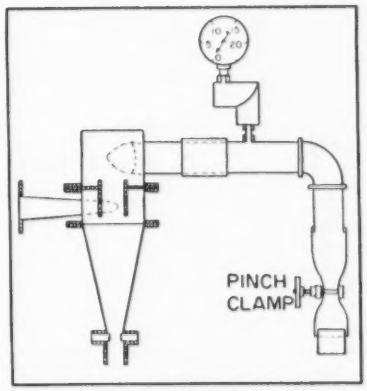


FIG. 4. EFFECT OF BACK PRESSURE on cyclone overflow after product has left separator was studied by using pinch clamp shown.

Tests can be run with rapidity after a routine procedure has been established. In fact, tests at several feed medium gravities can be run on the same batch of ore.

Another advantage of the 4-in. cyclone separator is that variations in cyclone vortex finders, apex apertures, conical sections, etc., may easily be studied at a minimum expenditure for parts. Our mechanics have built the many extra parts in our laboratory shop.

Water. The capacity of a cyclone which has been designed for separations by gravity difference is governed largely by the inlet nozzle area. However, the feed separates or splits into underflow and overflow products, according to the size of vortex and apex apertures employed, type of conical section, length of cylindrical section, and other variables, and these also affect the capacity to some extent.

In general, the capacity can be calculated from the formula which applies to the discharge of fluids from nozzles. The formula can be stated as follows:

$$Q = C_o A_2 \sqrt{2gh}$$

where:

Q = Cubic feet per second.
C_o = Coefficient of velocity.
A_2 = Nozzle area, square feet.
h = Height of head, feet.

For example: With a fire hose nozzle and free discharge, 45 lb. pressure at a 1⅛-in. nozzle should discharge 250 gpm. of water and C_o = 0.95 - 0.97. The formula may also take the form:

$$C = 29.7\ KD^2\sqrt{\frac{P}{g}}$$

where:

C = Capacity in gallons per minute.
K = Velocity constant.
D = Diameter of feed inlet in inches.
P = Pressure in lb. per sq. in.
g = Specific gravity of the pulp.

TABLE 2—Capacities and Flow Splits with Medium Only

Test No.	Feed Lb. Press.	Feed Gpm	Feed Gravity	Overflow Gravity	Overflow % Weight Pulp	Underflow Gravity	Underflow % Weight Pulp	Type of Cone	Remarks
5M	28	21.5	2.13	2.00	87.65	2.86	12.35	Tapered	Effect of varying the medium feed gravity and conical section.
4M	29	22.3	2.31	2.21	90.42	2.86	9.58	Tapered	
3M	30	22.1	2.45	2.41	91.61	2.81	8.39	Tapered	
1M	27	20.6	2.31	2.28	90.48	2.44	9.52	Truncated	
2M	30	22.1	2.45	2.44	91.27	2.49	8.73	Truncated	

In the above: Inlet = 11/16 in. Apex = 5/8 in. Vortex = 1 in.

Test No.	Feed Lb. Press.	Feed Gpm	Feed Gravity	Overflow Gravity	Overflow % Wt. pulp	Underflow Gravity	Underflow % Wt. Pulp	Vortex Dia., In.	Vortex Area	Vortex Circum.	Apex Dia., In.	Type of Cone
39M	24	20.0	2.32	2.24	80.11	2.71	19.89	1	0.785	3.14	11/16	Tapered
10M	26	22.9	2.32	2.26	88.91	2.74	11.09	1 1/4	1.23	3.93	11/16	Tapered
11M	26	22.9	2.33	2.29	90.09	2.67	9.91	1 1/4	1.23	3.93	11/16	Truncated
13M-A	24	26.5	2.32	2.27	91.68	2.72	8.32	1 9/16	1.92	4.91	11/16	Tapered
13M-B	23	27.6	2.32	2.29	90.72	2.71	9.28	2 1/8	3.46	6.68	11/16	Tapered
41M	19	27.0	2.32	2.31	95.42	2.70	4.58	3	7.06	9.41	11/16	Tapered
7M	27	24.5	2.31	2.27	89.01	2.86	10.99	1 1/4	1.23	3.93	5/8	Tapered
8M	27	23.8	2.32	2.28	87.46	2.73	12.54	1 1/4	1.23	3.93	5/8	Truncated
40M	23	22.9	2.32	2.19	63.18	2.70	36.82	1 1/4	1.23	3.93	15/16	Tapered

In a cyclone, there never is a "free discharge" because of back pressure created by the rotating core of pulp and resistance to flow from the vortex and apex openings. The coefficient of velocity, therefore, is considerably less than 0.95 as determined for a fire-hose nozzle. In fact, actual cyclone-separator capacity tests with water only give C_0 a value of 0.38 to 0.40. At feed pressures of 25 to 30 lb., and a magnetic medium, C_0 is about 0.40 to 0.45; and with magnetite medium plus ore, C_0 may decrease somewhat.

Table 1 shows the capacities and flow splits of the 4-in. cyclone separator with water only. It should be noted that for a given feed inlet, the capacity is affected more by a change in vortex aperture than in apex aperture, and that the flow splits may be changed by varying either the vortex or the apex apertures. The feed pressure is affected more by the vortex aperture than by the apex aperture. The intensity of the air suction up through the apex into the cyclone inner core is illustrated by the absence of underflow in those tests which employed small apex openings or large vortex finder openings. Much of the water which normally discharges at the apex is caught by the air suction and is pulled back into the cyclone where it becomes entrained in the overflow and is discharged therewith.

Medium. The volume capacity of a given cyclone separator for medium is about the same as for water even though the medium has a relatively high pulp density and viscosity. This can be seen by comparing the capacity data given in Table 2 with those in Table 1.

In the first part of Table 2 the capacity and medium flow splits are given for various feed gravities and for tapered and truncated conical sections. The second part contains data on the effect of varying the size of the vortex aperture.

It is of particular interest to note that the amount of medium discharged from the cyclone overflow increased only from 80 to 91% as the vortex diameter was increased from 1 in. to 2⅛ in. This can be explained by the fact that the medium leaving the cyclone through the vortex finder is whirling and is centrifuged to the inside wall of the vortex finder in a surprisingly thin film. The total discharge, therefore, is concerned more with circumference than with area of the vortex finder.

With the apex aperture held constant, an increase in the diameter of the vortex finder increases the gravity and volume of the overflow medium. Substitution of a truncated conical section results in less thickening action on the medium, the apex gravity being lowered and the overflow gravity being increased, but without appreciable effect upon the weight split.

With the vortex aperture held constant, an increase in the diameter of the apex results in a decrease in the gravity and volume of the overflow medium.

The effect of ore in the medium on flows splits is discussed later.

Medium Used

Structure. Except in special cases, the medium used for separation work is a suspension of magnetite in water. The magnetite used in our work is a magnetic concentrate from the Aurora preliminary taconite plant of the Erie Mining Co.

Fortunately, the taconite magnetic concentrate is well suited for use as a medium and requires no further grinding or treatment.

The structure or screen analysis may vary somewhat, but a typical structure is as follows:

Mesh	% Weight	Assay %	
+150	5 to 8	Fe	65.0
+200	7 to 10	SiO_2	6.5
+325	17 to 24	Mn	0.3
−325	65 to 75	Al_2O_3	0.2

Cyclones are efficient classifiers and even in uses as separators employing medium, the medium undergoes some classification. An example of the classification effect is shown. The following data were obtained by sampling the cyclone feed, overflow, and underflow, and underflow medium when the cyclone was operating on medium only—no ore was present in the feed.

	MEDIUM Feed	Overflow	Underflow
Specific Gravity	2.3	2.26	2.74
% Solids	74	72	82
Mesh	% Wt.	% Wt.	% Wt.
+100	2.43	2.09	3.84
+150	4.67	3.65	7.69
+200	7.48	6.47	12.01
+325	18.30	19.09	28.53
−325	67.12	68.70	47.93
Total	100.00	100.00	100.00

Cyclone-apex 11/16 in. Vortex 1 1/4 in. Tapered cone

As the pulp density of the medium is decreased, the classification effect of the cyclone separator increases. This tends to make the overflow medium finer which, incidentally, makes the recovery of medium from the overflow magnetic separators more difficult.

Magnetized or Demagnetized Medium. In our work, the medium is not purposely demagnetized, but the magnetic flocculation is not pronounced because much of the magnetism is lost between the time the magnetite is recovered from the taconite ore and the time it is used as a medium. In commercial-sized cyclone-separator plants, the medium generally is not demagnetized. The effect of magnetized medium

versus demagnetized medium is discussed later.

Effect of Auxiliary Cylindrical Section on Medium Flow

The height of the cylindrical feed inlet section of the cyclone separator may be varied considerably without greatly affecting the function of the cyclone. A longer cylindrical section provides a greater retention time in the cyclone and this in turn may assist in sharper separations.

The effect of an auxiliary cylindrical section on medium flow was studied briefly by inserting between the feed inlet section and conical section a cylindrical section $2\frac{1}{8}$ in. high, as shown in Fig. 3.

Flows of medium through the cyclone with and without the cylindrical section are shown in Table 3. The effect on ore separations is discussed later.

Effect of Back Pressure on Overflow Discharge

The effect of throttling the cyclone overflow after the product has left the cyclone separator was studied by applying a pinch-clamp restriction to the overflow pipe, as illustrated. A pressure gage tapped into the overflow pipe, as shown, indicated the amount of back pressure on the cyclone separator.

The back pressure has a sharp adverse effect on the cyclone operation, as will be seen by inspecting Table 4. Note in particular that the gravity differential is greatly reduced, the flow split is markedly changed and the capacity is affected.

Effect of Mixed Ferrosilicon-Magnetite Media

In cases where a medium of high specific gravity (that is, over 2.50) is desired, a blend of magnetite and ferrosilicon may be used.

The size of the ferrosilicon is highly important and should be much finer than that employed for the standard Heavy-Media separations. Coarse ferrosilicon tends to be discharged with the cyclone apex product, making the specific gravity of the apex medium high but having little or no effect upon the overflow gravity.

Table 5 shows some data on medium splits when using a mixture of finely-ground ferrosilicon and magnetite.

Usually, as the feed medium gravity is increased, the underflow medium gravity quickly reaches a maximum and remains there; the overflow medium gravity progressively increases until it is nearly the same as the gravity of the feed.

The second and concluding part of this article will appear in the September issue.

TABLE 3—Effect of an Auxiliary Cylindrical Section

Test No.	Feed Lb. Press.	Feed Gpm	Feed Gravity	Overflow Gravity	Overflow % Wt. Pulp	Underflow Gravity	Underflow % Wt. Pulp	Diameter Vortex, In.	Diameter Apex, In.	Auxiliary Cylindrical Section
10M	26	22.9	2.32	2.26	88.91	2.74	11.09	$1\frac{1}{4}$	$\frac{11}{16}$	None
23M	24	25.0	2.32	2.24	85.23	2.80	14.77	$1\frac{1}{4}$	$\frac{11}{16}$	$2\frac{1}{8}$-in. high
13M-B	23	27.6	2.32	2.29	90.72	2.71	9.28	$2\frac{1}{8}$	$\frac{11}{16}$	None
26M	22	26.6	2.33	2.26	82.67	2.63	17.33	$2\frac{1}{8}$	$\frac{11}{16}$	$2\frac{1}{8}$-in. high

TABLE 4—Effect of Back Pressure on Overflow Discharge

Test No.	Feed Lb. Press.	Feed Gpm	Feed Gravity	Overflow Gravity	Overflow % Wt. Pulp	Underflow Gravity	Underflow % Wt. Pulp	Vortex Dia., In.	Applied Back Pressure
21M	25	26.0	2.33	2.26	85.80	2.88	14.20	$1\frac{1}{4}$	None
21M	25	24.3	2.33	2.27	82.02	2.67	17.98	$1\frac{1}{4}$	$1\frac{1}{2}$ psi
22M	24	23.4	2.33	2.30	75.46	2.45	24.54	$1\frac{1}{4}$	3 psi
13M-B	24	27.6	2.32	2.29	90.72	2.71	9.28	$2\frac{1}{8}$	None
19M	22	27.5	2.33	2.29	78.73	2.47	21.27	$2\frac{1}{8}$	$1\frac{1}{2}$ psi
20M	22	26.9	2.33	2.33	69.17	2.34	30.83	$2\frac{1}{8}$	3 psi

Note: At 3.0 lb. back pressure, the air suction at the apex was no longer evident.

TABLE 5—Effect of Mixed Ferrosilicon-Magnetite Medium

Test No.	Feed Lb. Press.	Feed Gpm	Feed Gravity	Specific Gravity Overflow	Specific Gravity Underflow	% Weight Magnetite	% Weight Ferrosilicon	Structure of Ferrosilicon
SL-10	21	28	2.52	2.51	2.73	100.0	——	None added
SL-7	21	28	2.61	2.51	3.16	83.8	16.2	−48 Mesh
SL-5	19	29	2.67	2.64	2.91	75.2	24.8	All −80 Mesh

Shaped Charges Inferior in Breaking Taconite

AS A RESULT of studies designed to contribute to the solution of taconite mining problems, the U. S. Bureau of Mines has issued Report of Investigations 4918, on "Taconite Fragmentation," under date of June, 1953. Its findings are as follows:

Application of shaped charges in primary blasting of taconite appears to be of no advantage.

In secondary blasting of taconite, conventional, capped charges produce better breakage than do shaped charges of the designs tested.

Based on the results of conventional blasting practice in horizontal, inclined, and vertical-hole tests, no better fragmentation is obtained from blasting horizontal or inclined holes than with vertical holes.

Holes drilled in staggered parallel rows that intersect both series of joint planes at the greatest possible angle give maximum breakage compared to rows parallel to one of the series of joint planes.

Methods of detonation made little difference in breakage; but the milli-second delay caps produce the best conditions for moving the broken rocks.

IDEALLY LOCATED on the quiet, deep Sunndalsfjord, about 45 mi. from the coast, Rödsand Gruber at Rausand, Norway, can ship its 66% iron concentrate and receive operating supplies and equipment directly by sea.

Underground Receiver at Rödsand

I HAVE OBSERVED some excellent mining techniques at Rödsand Gruber, A/S, at Rausand, Norway, which show how well the Norwegian miners keep abreast of the times. This mine is ideally situated on Sunndalsfjord, on quiet, deep salt water about 45 miles from the coast. Everything comes to the mine by sea, and all shipments are made by sea.

Concentrates produced here, containing about 66% iron, are shipped to Aardal for smelting. Since the magnetite ore contains about 0.3% vanadium, pig iron produced from the concentrate commands a premium for steel making.

Rödsand Gruber's technical staff is headed by Olav Overlie, technical director, a title which is comparable to general superintendent in America. One of Mr. Overlie's problems was that of developing a method which would enable a two-man crew to put in a complete drift round in a 6 hr. 10 min. shift. Having observed similar conditions in America, Mr. Overlie was convinced that the job could be done, but only by trained men using the best of equipment powered by a reliable source of clean, cold compressed air.

C. C. AUSTIN, well-known mine haulage authority, and retired general manager, Mancha Division, Goodman Manufacturing Co., now touring Norway and Sweden, has kindly offered to record his observations of modern mining practice for *E&MJ* readers. Here is what he saw at the Rödsand Gruber property.

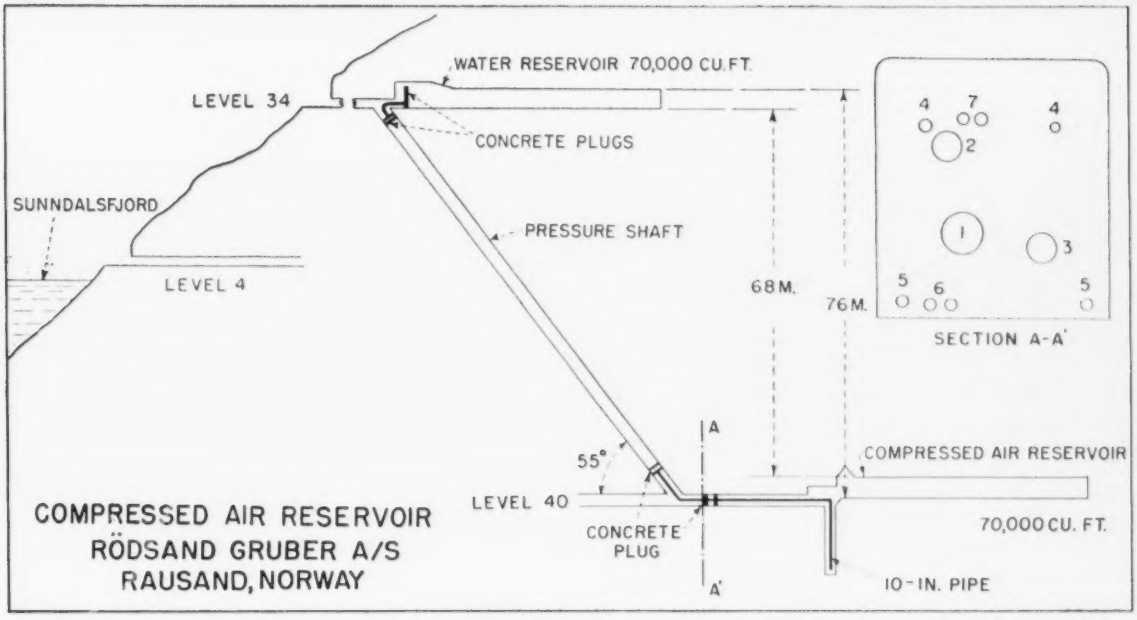
He could train the men; he had good Swedish drills, tungsten carbide bits, Eimco loaders, and German battery locomotives; but his compressors were overloaded and larger ones would have proved too costly. The old compressors were (and still are) delivering 19 cu. m. of free air per minute.

Because the rock formation at the mine was dense, hard, and free from cracks and fissures, Mr. Overlie decided to use a well-known air reservoir (receiver) system which is used infrequently despite its simplicity and manifest advantages.

The accompanying diagram illustrates the system used. Two 70,000-cu. ft. chambers, 4 m. high were excavated in solid rock—one 68 m. above the other. They were connected by a 55-deg. pressure shaft. This angle allowed the lower chamber to be offset, so that it would not lie below the upper chamber, thereby eliminating the possibility that blasting in either chamber might crack the intervening rock.

A concrete plug at AA′ pierced by air-tight pipe holes is illustrated, and functions of the various holes are listed below the drawing.

The outlet of the 10-in. water pipe is about 10 m. below the floor of the air receiver so that the hydraulic pressure at that point is about 1 kg. per sq. cm. higher than the air pressure required to empty the air reservoir. This is a safety



HYDRAULIC HEAD from water reservoir maintains constant supply of cool, clean compressed air in lower reservoir (receiver). Plug at AA' contains following openings: (1) Manhole for inspection. (2) 10-in. air line to mine. (3) 10-in. water pipe to pressure shaft. (4) 4-in. air lines from compressors. (5) Discharge pipes. (6 and 7) 1-in. water level indicators. Compressors operate only during off-peak power periods. Air pressure remains steady through shift.

Provides Steady Mine Air Supply

measure against faulty operation of the compressor safety valves.

Air from the compressors is forced into the receiver until all water is forced into the upper reservoir which has an open connection to the atmosphere. This water then maintains constant pressure in the air reservoir subject to the slight variations in the depth of water in the upper reservoir.

Following are the advantages of this system:

1. The compressors work at full load when operating. There are no peak loads.

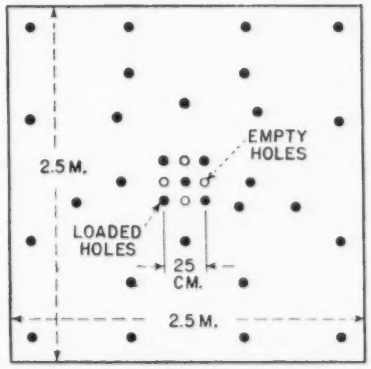
2. The compressors work only when the air reservoir is full or nearly full of water. Hence they can work at night when there is no other electric load.

3. One compressor now does the work which two could not formerly do.

4. Air pressure is constant—subject only to variation in depth of water in the upper reservoir. The air is always cold and clean.

5. The air reservoir is big enough to keep the mine running at full capacity for 3 to 4 shifts after the compressors shut down.

With this adequate compressed air supply at constant pressure, two-man mine crews have been able to muck, drill, load, and blast a drift round every shift of 6 hr. 10 min. working time. The drift measures 2.5x2.5 m.; 34 holes each 33 mm. in dia. and 1.6 m. long are drilled per round. See drawing of drift round. Holes are parallel with the drift and drilled as shown.



DRIFT ROUND designed for 6 hr. and 10 min. complete mining cycle.

Equipment used consists of Atlas Diesel air-leg drills, integral chisel-type tungsten-carbide bits of inserted steel. Each bit will drive 150 to 400 m. in magnetite, and 200 to 600 m. in gabbro. Bits must be reground with carborundum wheels after every 20 to 50 m. of drilling.

Explosives consumption is 14 to 18 kg. of Lynitt dynamite per meter of drift.

Each round fills 8 to 10 Granby cars of 2-cu. m. capacity. Cars are loaded with Model 21 Eimco loaders, and hauled by a 4 or 6-ton Siemens battery locomotive an average distance of 300 to 400 m.

Everyone in the mine believed it would be very difficult for two men to drill out and complete a round per shift. So after modern equipment was provided it was up to Mr. Overlie to demonstrate that the job could be done.

He selected young active men, told them what he wanted, and planned the job with them. Then he "put in the shift" with them for about two weeks, often doing the work himself to demonstrate various techniques. Now the full round per shift is standard practice at the mine.

I wish to thank Mr. Overlie and his staff for all courtesies extended to me during my recent visit.

NOTE HOW CLEARLY mine detail shows up through the multiple acetate sheets of this mine model.

How to Make Better Mine Models

EARL L. PHILLIPS
Cartographer
Bunker Hill & Sullivan Mining
and Concentrating Co.
Kellogg, Idaho

MINE MODELS are generally built to show geology and mine openings in three dimensions. Few are entirely satisfactory, but most models are very helpful in visualizing three dimensional workings. At Bunker Hill, two durable mine models which are of unique construction in some respects merit description for other companies which might find them useful also. One model mounted on an aluminum frame shows the entire Bunker Hill mine consisting of many miles of underground workings, and the other, suspended in a wooden frame, is used to view only small portions of the mine. Costs of the models, exclusive of mapping work, are $900 and $300 respectively.

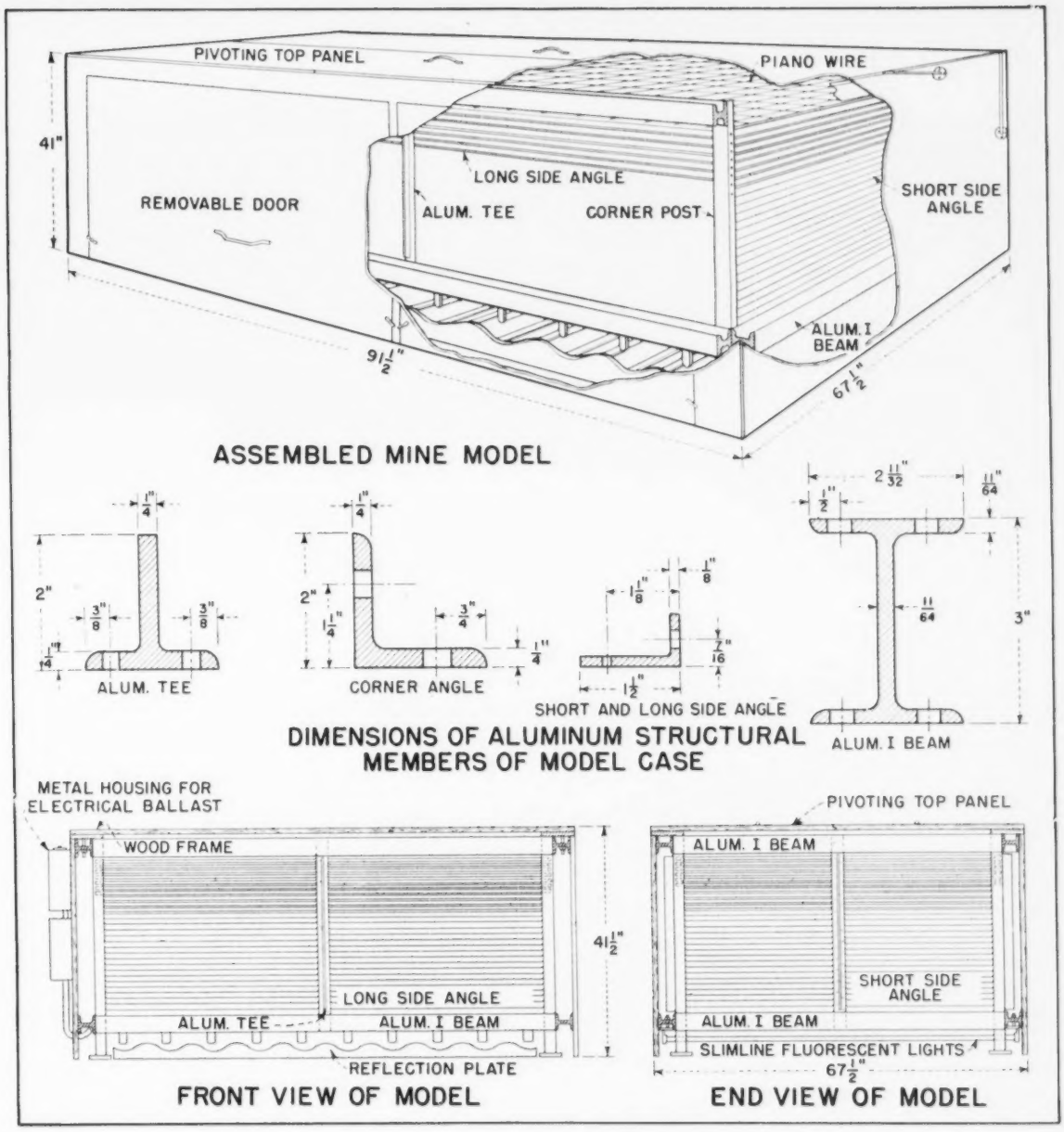
The Bunker Hill mine covers an area 13,000 ft. long by 11,000 ft. wide. It is opened to a depth of 5,300 ft. vertically below the surface. Since glass is unsatisfactory for the 3 to 4-ft. spans involved in making scale models for workings of this size, thin acetate sheets supported by a grid network of piano wire strings on an aluminum frame were selected to show three-dimensional views of the mine. With care the piano-wire grid can be assembled to serve as coordinates for the model. The skeleton framework is enclosed in a wooden box for protection.

EARL L. PHILLIPS, Cartographer, for Bunker Hill & Sullivan Mining and Concentrating Co., and author of this article, demonstrates transparency of a sheet of acetate used in the unique mine model described here.

Aerial extent of existing mine workings plus the probable additional expansion of the mine in the next 15 years was anticipated to be 3x2 mi. horizontally and 1 mi. vertically. The scale chosen to represent these distances horizontally and vertically was 1 in.=200 ft. This gave an overall floor dimension for the model of 6 ft. wide by 8 ft. long. Vertical scale must be the same as the horizontal scale to achieve a true, three-dimensioned picture. Conventional symbols are used to show mine workings, geology, and topography. Colored inks are applied by air brushing or with drafting instruments. The aluminum frame lightens the floor load. Construction details covering both models are given in the accompanying drawings and illustrations.

Procedure in assembling the mine model is as follows:

1. Attach long and short aluminum angles to corner angles with bolts and nuts. Do not tighten.
2. Secure aluminum I-beams to corner angle by bolts and nuts.
3. Tee angles can now be attached to I-beam, and to long and short angles.
4. With use of eight ⅛-in. diameter, stiff, steel rods line up the



vertical holes by using two rods on each side. When rods are lined up then secure all bolts and nuts to keep the true horizontal grid and vertical line.

5. Turn model on its side to start stringing piano wire from the bottom towards the top. It is very important to string long wires first completely across each layer. The short wires in each layer are then placed on top of the long wires. The reason for having short wires on top of the long ones is that acetate sheets will slide on the short wires while being inserted or removed. Lengths of piano wire should be cut one at a time and not allowed to curl or twist. Knot one end and push through grid hole. Secure knot with spring and run other end to far side through the holes and back. Loop knot at this end and insert through hole to be attached by spring at other end. A pair of pliers and metal crochet hooks will assist greatly while attaching the spring and loop knot. After each wire has been strung, test its strength by plucking. If a wire becomes twisted during stringing it will break. Springs are used to compensate for expansion and contraction of the steel wires with changes in room temperature.

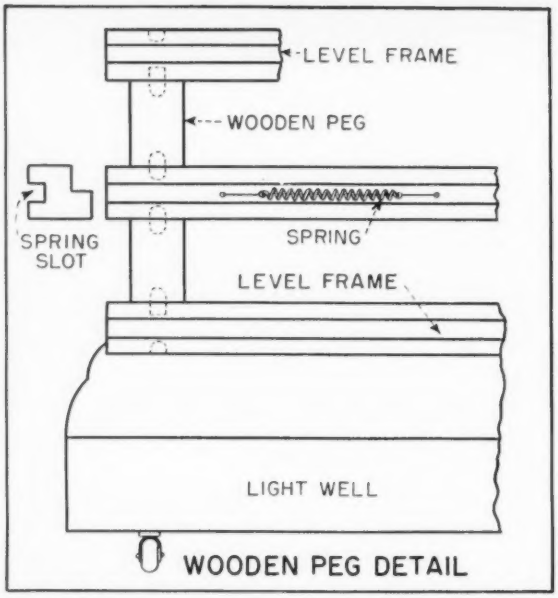
6. Turn model right side up and mount fluorescent lighting as shown on drawing above.

7. The reflection plate can be surfaced with crinkled aluminum foil which helps to even out zones of light intensity and will result in stronger and brighter lighting from the multitude of reflecting surfaces.

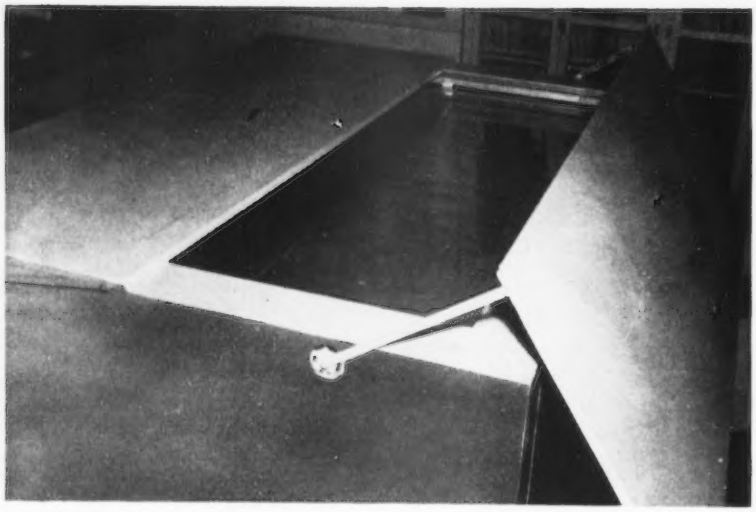
8. Wooden panels can be secured with bolts and nuts to the I-beam. As the top view shows, removable side doors are necessary to insert sheets. The pivoting top has the advantage of using less space and is easily opened and closed by one person.

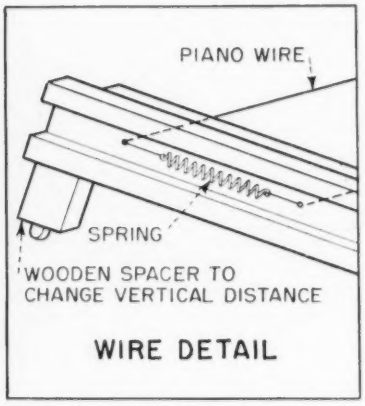
9. Electrical ballast may be secured to wooden frame on the

WOODEN PEGS conform to scale of mine level intervals.



SPRINGS keep tension in wires supporting acetate sheets.





FURTHER DETAIL is shown above. Top of aluminum frame of mine model is pivoted, and opens to either side as shown at left.

outside of the model case so that the heat is dissipated without injury to the model.

10. Insert acetate sheets upon which are drawn the outline of mine openings, geology, topography, or any other features which it may be desired to show.

Acetate sheets offer many advantages. They can be rolled to a 2-in. diameter and will not crack or break. Water-proof inks will not chip or run and a solution of soap and water applied with a swab will remove the ink. Acetate is more transparent than glass. It is very light in weight, and one person can remove large sheets easily. Acetate comes in various thicknesses, though for use at the Bunker Hill mine it was found that 0.01 in. was most adaptable. It is made by the Craftint Manufacturing Co., Calif. One disadvantage of acetate is its susceptibility to scratches.

Wood Frame Model

The wood frame model for viewing only small areas of the mine is simple to construct. It is used as an aid where only small blocks of ground need to be seen in three dimensions. As the vertical scale is easily varied, the model is particularly helpful in representing parts of the mine where the level interval is not uniform. The outside frame is 37 x 35-in. The model is illuminated by fluorescent lights placed in the bottom, with light being diffused by a frosted acetate sheet mounted 6 in. above the fluorescent tubes. Wire grid serves the same purpose as in the 200-scale aluminum frame model. Mounting of springs and wire detail are illustrated in drawing above. The wire goes through the wood frame and connects the spring with the same kind of loop knot as is used in the model. Drawing at top shows how the frames representing each level are assembled. Wooden pegs may be cut to vary the vertical distance between levels. This model has at least one disadvantage—single sheets can not be removed for alterations. The entire assembly must be lifted to get at any one sheet.

Editor's Note

We believe that the science of statistics is one of the alert engineer's most useful tools. Its widespread use outside the mining industry has proved its value. In our industry, despite complexities of application, it is gaining acceptance steadily. Here is a report on why and how one progressive mining company is applying statistics for quicker, more accurate testing in the mill.

Because few engineers in the mineral industry have had training in the statistical approach and its terminology, we suggest that to get more out of this article, the reader refer to an earlier paper by Mr. Dorenfeld, "A New Way to Get Better Results, Save Money in Mill Testing", which appeared in the October, 1952, issue of *E&MJ*. Reprints of that article, essentially a primer on the application of Factorial Design to mill testing, may be obtained at no charge by writing to The Editor, *Engineering and Mining Journal*, 330 W. 42nd St., New York 36, N. Y. The reprint also contains a useful bibliography.

Magma Copper Uses Factorial Design for Better Testing

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ONE OF THE ROUTINE TASKS of the flotation metallurgist is testing new flotation reagents developed by manufacturers. When a new reagent is equal to, or slightly better than reagents in use, interpretation of tests has been difficult. Differences in results are generally so small, the metallurgist often wonders whether they are errors in testing, sampling, and assaying.

For example, assume two reagents X and Y are exactly equal insofar as collecting power for a certain mineral is concerned. A series of the usual tests is run, and due to experimental error reagent X is shown to be slightly superior. A second series indicates that the reagents are equal. A third series may show X to be superior again. At this point a conclusion is drawn that X is superior to Y. Actually, a great many tests would have to be made before such a conclusion could be valid.

In fact, if two reagents were equal and the *usual comparative methods of testing were used*, it is more probable that one would be shown to be superior to the other than that they would be shown to be equal.

The concentrator of the Magma Copper Co. at Superior, Ariz., treats 1,500 tons per day of high grade copper ore consisting largely of chalcopyrite, pyrite, and siliceous gangue. The ore is ground to 65% minus 200 mesh. A rougher concentrate is floated which is reground and cleaned. Recovery is the primary objective, and due to regrinding and cleaning, the grade of rougher concentrate is not too important within limits.

A new collector, we'll call it Reagent A, submitted to Magma Copper Co. was tested in the laboratory by two methods: (1) **Standard Procedure**, i.e., making flotation tests under conditions simulating plant operations and then testing the new reagent with the same ore sample under the same conditions; (2) **Factorial Design.**

By Standard Tests, The New Reagent Looked Good . . .

Table 1—Ore Sample #1

pH and Frother Constant, Reagents Varied

Test No.	Reagent 404 lb./t.	Z-8 lb./t.	New Collector lb./t.	Remarks	Results Cu, % Tailing	Conc.
1	0.15	0.10	....	Standard Test	0.20	17.27
2	0.15	....	0.09		0.18	20.15
3	....	0.15	0.09		0.20	19.39

Table 2—Ore Sample #2

pH and Frother Constant, Reagents Varied

Test No.	Reagent 404 lb./t.	Z-8 lb./t.	New Collector lb./t.	Remarks	Results Cu, % Tailing	Conc.
4	0.15	0.10	....	Standard Test	0.14	15.76
5	....	....	0.125		0.14	17.07
6	....	....	0.23		0.14	15.66

A sample of ore was taken over a 24-hr. period, crushed to 8-mesh, thoroughly mixed, and 1,000 gram charges made up. Charges were wet ground in a laboratory ball mill to 65% minus-200 mesh, with 6.0 lb./ton of lime and 0.15 lb./ton of Reagent 404. This slurry was then floated for 10 minutes at 21% solids using, as secondary collector, 0.10 lb./ton potassium sec-butyl xanthate (Z-8). The frother, methyl isobutyl carbinol, was kept constant at 0.07 lb./ton in all tests.

Four different samples of ore were tested under different conditions, and the results are summarized in Tables 1-4. *(Continued on next page)*

Table 3—Ore Sample #3

ph and Frother Constant, Reagents Varied

Test No.	Reagent 404 lb./t.	Z-8 lb./t.	New Collector lb./t.	Remarks	Results Cu, % Tailing	Conc.
7.....	0.15	0.10	....	Standard Test	0.20	19.10
8.....	....	....	0.09		0.19	21.10
9.....	....	....	0.07		0.21	21.60

Table 4—Sample #4

Frother Constant

Test No.	Lime lb./t.	Reagent 404 lb./t.	Z-8 lb./t.	New Collector lb./t.	Results Cu, % Tailing	Cocn.
10.....	0.0	0.15	0.10	....	0.31	13.82
10 (a)....	0.0	0.15	....	0.09	0.93	15.66
11.....	0.5	0.15	0.10	....	0.35	14.48
11 (a)....	0.5	0.15	....	0.09	1.27	14.69
12.....	1.0	0.15	0.10	....	0.19	14.63
12 (a)....	1.0	0.15	....	0.09	0.17	15.12
13.....	1.5	0.15	0.10	....	0.19	14.80
13 (a)....	1.5	0.15	....	0.09	0.17	15.82
14.....	2.0	0.15	0.10	....	0.17	14.80
14 (a)....	2.0	0.15	....	0.09	0.14	16.52

Tables 1 and 4 show that the use of the new reagent yields a higher copper recovery, but Tables 2 and 3 show that the new reagent is substantially equal to Z-8 insofar as copper recovery is concerned. Since each table is based on a slightly different ore, it might be concluded that the new reagent yields a higher copper recovery on some of the ores, at the very least. Although this particular reagent is considerably more expensive than the Z-8 already in use, any additional recovery of copper would more than pay for the increased reagent cost.

While the new reagent showed higher grades of copper concentrate in all series, economically, at Magma, this is of minor importance.

. . . But Factorial Design Showed No Important Difference

A sample of ore taken over a 24-hr. period was crushed to 8-mesh and sample charges of 1,000 grams were taken from this. The sample *was not* mixed. The variables investigated and conditions are listed in Table 5. Three variables, each at two levels, require eight tests.[2]

All tests contained 0.08 lb./ton of Reagent 404 and 0.07 lb./ton of methyl isobutyl carbinol as frother. Flotation time was 10 minutes. The sequence of tests was "drawn out of a hat" to avoid grouping any errors in technique or sampling at a particular level. Thus each secondary collector reagent had the opportunity to exhibit its characteristics under four different conditions. These tests, physical conditions and results are summarized in Table 6.

Using the procedure discussed in previous papers[1, 2] the calculation prior to statistical analysis is as follows:

Recovery

$$\text{Correction factor} = \text{C. F.} = \frac{(\text{Total recoveries})^2}{\text{Number of tests}} = \frac{(66.1)^2}{8} = 546.15$$

Summing over the (L) variable (adding results regardless of the level of the (L) variable), we obtain:

	C1	C2
G1	16.2	16.8
G2	16.3	16.8
Total	32.5	33.6

The effect due to variation of

$$\text{collector C} = \frac{32.5^2 + 33.6^2}{4} - \text{C.F.} = 0.15$$

Similarly the (L) and (G) variables are summed over as follows:

	G1	G2
L1	16.8	16.7
L2	16.2	16.4
Total	33.0	33.1

	L1	L2
C1	16.4	16.1
C2	17.1	16.5
	33.5	32.6

Table 5—Variables Tested

Variable	1st Level	2nd Level
Secondary Collector (C1 and C2)	New Reagent A 0.06 lb./ton	Z-8 0.06 lb./ton
Lime (L1 and L2)	4.0 lb./ton	7.0 lb./ton
Grind (G1 and G2)	8%+65-mesh	4%+65-mesh

The effect due to Grind, G = 0.0
The effect due to Lime, L = 0.10

As shown in the papers cited, interactions may occur between variables; i.e., the results (grade, recovery) may be a function of two variables. As an example usually used in flotation, cyanide ion has little effect at certain concentrations of lime but a considerable effect at others.

To obtain the interaction effect between C and G the following procedure is used:

$$\text{C x G effect} = \frac{16.2^2 + 16.3^2 + 16.8^2 + 16.8^2}{2} - (\text{C. F.} + \text{C} + \text{G}) = 0.0$$

Similarly G x L effect = 0.02
L x C effect = 0.02

Thus, Table 7 may be constructed.

Interpretation

(1) The interactions are first compared with the residual. Since they are smaller than the residual, their effect is not significant and they become part of the experimental error.

(2) New residual $= \frac{0.06 + 0.0 + 0.02 + 0.02}{4} =$ 0.025, with 4 degrees of freedom.

(3) Each of the main effects is now compared with the residual as follows:

Table 6—Results of Factorial Design Tests

Test	0.06 lb./t. secondary collector	Grind	Pounds kon lime	Assays, % Cu Heads	Conc.	Tailings	Cu Recovery Percent*	(Recov.)²
1	A	8%+65	4	6.51	14.85	0.20	(9) 8.3	68.9
2	A	4%+65	4	6.32	16.40	0.19	(9) 8.1	65.6
3	A	8%+65	7	6.25	15.85	0.22	(9) 7.9	62.4
4	A	4%+65	7	6.32	16.20	0.18	(9) 8.2	67.2
5	Z-8	8%+65	4	6.34	13.25	0.18	(9) 8.5	72.3
6	Z-8	4%+65	4	6.10	13.45	0.16	(9) 8.6	74.0
7	Z-8	8%+65	7	6.65	15.20	0.20	(9) 8.3	68.9
8	Z-8	4%+65	7	6.50	16.45	0.19	(9) 8.2	67.2
	Total						66.1	546.5

*90 may be subtracted from each recovery figure for ease of computation. This has no effect on the final result.

$$C: \frac{0.15}{0.025} = 6.0 \qquad nc = 1$$

$$G: \frac{0.00}{0.025} = 0.0 \qquad nr = 4$$

$$L: \frac{0.10}{0.025} = 4.0 \qquad n = \text{degrees of freedom}$$

Consulting the F distribution[3] table for 1 degree of freedom in the numerator and 4 degrees of freedom in the denominator we see that in order for a variance ratio to be 95% significant it must be at least 7.71. The ratio of our collector variance to our residual variance is only 6.0. Therefore, we conclude the effect of changing from Z-8 to Reagent A (or vice-versa) will not significantly affect the recovery of copper. Since Reagent A is more expensive than Z-8, the decision, based on factorial design, would be that a change of reagents is undesirable.

Additional information can be obtained from these tests. All eight tests have been shown to be chance variants of each other because the "F" distribution of variances is not significantly different. Therefore, the variances of Table 7 may be added, and averaged. This yields an average variance of 0.044%. The standard deviation is the square root of the variance, or in this case, 0.21%. The expected recovery of any one test is the average recovery of the eight tests or 98.26 ± 0.21% copper.

Table 7—Interaction Effects

Source of Variance	Sums of Squares	Degrees of Freedom	(Sums—Degrees) Variance
Secondary Collector (C)	0.15	c*-1=1	0.15
Grind (G)	0.10	c*-1=1	0.10
Lime (L)	0.00	c*-1=1	0.00
C x G	0.00	(c-1) (g-1)=1	0.00
G x L	0.02	(c-1) (g-1)=1	0.02
L x C	0.02	(c-1) (g-1)=1	0.02
Residual	0.06	(c-1) (g-1) (l-1)=1	0.06

Total sum of Squares 0.35.

Total Sum of Squares = Sums of Squares of each test − C. F. = 0.35.

*Refers to number of levels of C, G, & L.

Table 8—F-Distribution Table*

Degrees of Freedom

Denominator	Numerator 1	2	3	4	5	6	7
1	161	200	216	225	230	234	237
2	18.51	19.00	19.16	19.25	19.30	19.33	19.36
3	10.13	9.55	9.28	9.12	9.01	8.94	8.88
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88

*Portion of Table only.

The Proof Lay in the Mill Test

Two identical flotation sections of the Magma mill were run in competition with each other for one month. The conditions and results are summarized in Table 9.

The recoveries in Table 9 are identical. Conclusions based on standard test methods are in error, whereas conclusions based on factorial design testing are accurate. The new collector did not affect the recovery of copper.

Factorial design is not a panacea for all the ills of flotation testing. Some thought must be given to the design of each test series and some preliminary tests are usually necessary. Judgment is never suspended in deference to pure statistical mathematics. This method, however, is certainly a more sensible method of interpreting flotation test work.

Table 9—Mill-Scale Tests

	Collector Reagents	Tailings Cu %	Rough Conc. Cu %
Section 2	Reagent A+404	0.203	14.40
Section 3	Z-8+404	0.202	13.95

Acknowledgments

The authors are indebted to the management of the Magma Copper Co. for permission to publish these results, and to Albert Wallach, assistant metallurgist, Magma Copper Co., for much of the laboratory work.

REFERENCES

[1] Dorenfeld, A. C., "Five Variable Flotation Tests Using Factorial Design." *Trans. A.I.M.E.*, Vol. 190, pp. 1073-1080.

[2] "A New Way to Get Better Results, Save Money in Mill Testing," *E&MJ*, Oct., 1952.

[3] Fisher and Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, Oliver and Boyd.

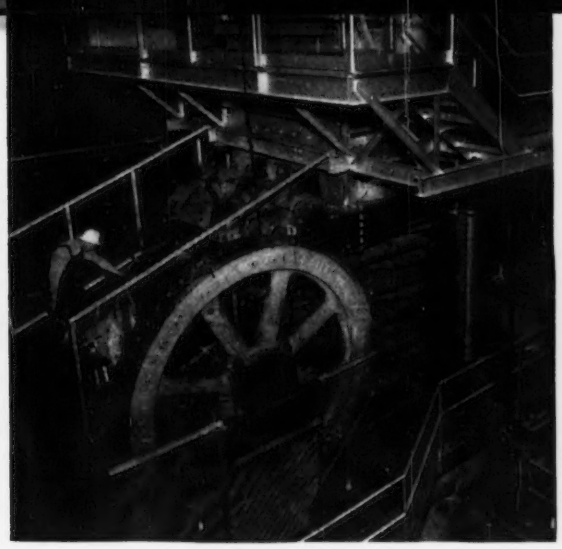
LARGEST OF PILOT PLANTS yet built for concentrating taconite experimentally with commercial size equipment, the new Pilotac concentrator of U. S. Steel's Oliver Iron Mining Division on the Mesabi Range is seen here with construction completed and in partial operation. Before long it is expected to be in full operation. Rated capacity is 500,000 tons of high-grade concentrates per year, equivalent to 1½ to 2-million tons of crude taconite annually. 1. Coarse crushing. 2. Secondary crushing. 3. Concentrator, employing magnetic separation.

Oliver's New Taconite Plant

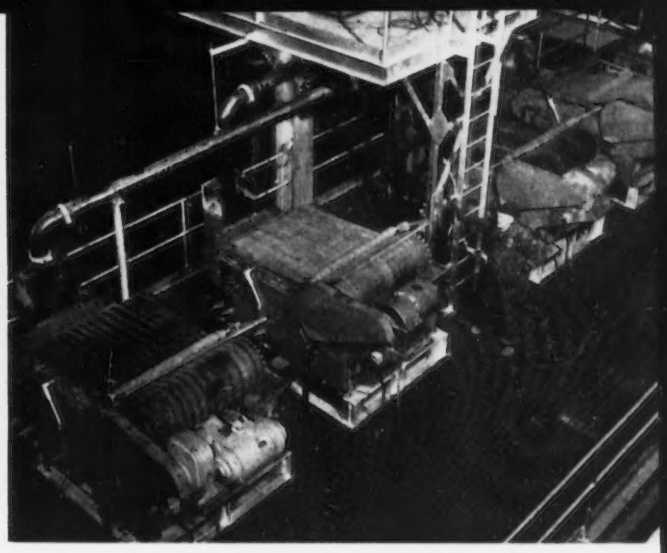
THE TACONITE RESEARCH PROGRAM of U. S. Steel Corporation's Oliver Iron Mining Division which has reached its high point for the present in the new 500,000-ton Pilotac experimental beneficiation plant on the Mesabi had its start in 1946, when Oliver equipped and staffed a large modern laboratory in Duluth as a research center. Extensive test work ensued with various concentration flowsheets, as well as with methods of agglomerating the fine concentrates, to secure a product that would stand rough handling both in shipment and on being charged into blast furnaces.

Photos and Facts Courtesy U.S. Steel

SIX BLAST HOLE DRILLS with shovel and train are at work here in experimental mine approximately one mile from Pilotac plant. To date about 1½-million cu. yd. of overburden lying 15 to 30 ft. deep above taconite surface has been stripped. Holes are 6 and 9 in. in diameter, drills are of both percussion and air-driven types. Later, some use may be made of jet-piercing. To start mine a 40-acre tract was first marked out as a site and stripping begun. View has been taken looking east. Plant is seen in distance in upper left corner of picture.



JAW CRUSHER in coarse-crushing department at Pilotac plant rests on foundations that go deep into solid rock. It will handle slabs of taconite as big as 7 ft. and is set to crush to 10-in. size. Rock comes to it from 350-ton receiving bin via a pan feeder.



BELT-TYPE MAGNETIC SEPARATORS, here seen, in addition to drum-type units, form part of equipment in magnetic separator section of concentrator.

Tuning Up

As the need grew for increasing the scale of operation, necessary steps were taken in the Duluth laboratory, first toward a "plant" that would handle 400 to 1,000 lb. per hr., then toward one that could handle 3,200 lb. per hr.

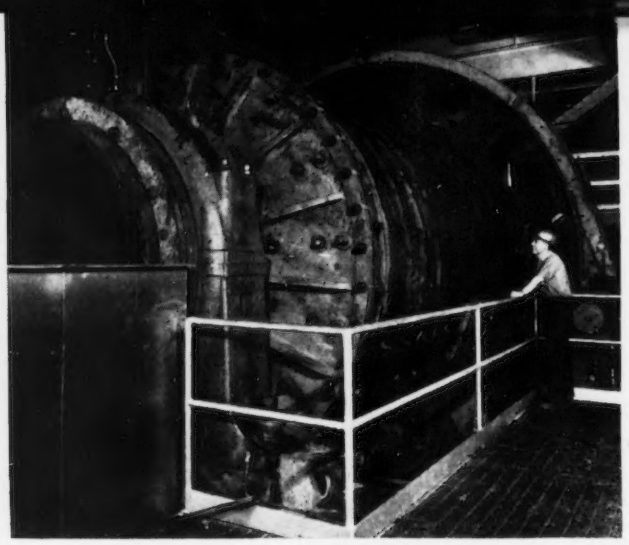
Finally decision was announced early in 1950 to

ELECTRIC SHOVEL is loading taconite into side-dumping railroad cars with 8-cu.-yd. dipper. Tendency of taconite to break into blocks on being blasted may be noted. This mine is experimental in character, as is the Pilotac plant itself. Latter may be seen a mile away.

DRILL is making 6-in. blast hole in taconite with tungsten-carbide-insert bit. Of a now well-known type, the machine uses an air-driven rock drill, which feeds down on mast as hole deepens. Air furnished by compressors on crawler-mounted chassis operates drill, ejects cuttings.

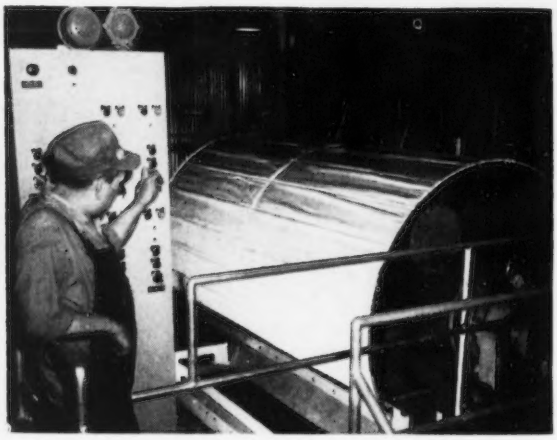
Please turn to p. 102

BATTERY OF SCREENS in Pilotac plant's fine-crushing building receive crushed product from two gyratories. Equipment of this department includes two more gyratories followed by another battery of screens.



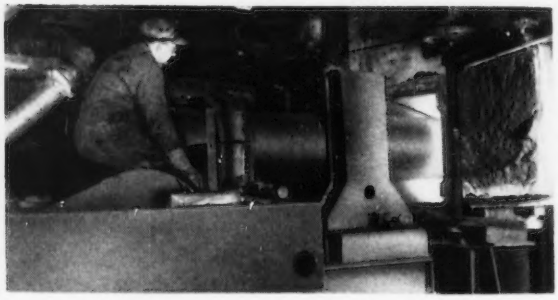
ONE OF THE ROD MILLS installed in the grinding section of the concentration building reduces minus ¾-in. taconite fed to it from the 1000-ton storage bins to less than 1/10 in. in size.

CONTINUOUS-TYPE SINTERING MACHINE at Virginia is 6 ft. wide and 96 ft. long. Coke breeze or fine anthracite is mixed in pug mill with concentrates or iron ore fines and return sinter to form charge on pallets. Oil or gas is used to ignite charge.



DEWATERING of final concentrates from magnetic separation section is being done on this drum-type filter in Pilotac plant. Filter fabric used is of nylon.

SEGMENTED ROTARY COOLER, slowly revolving, receives hot sinter discharged at end of pallet line. Sinter is then screened and conveyed to bin.



AT NODULIZING KILN at Virginia, rings of fused material that build up around inside circumference of 350-ft. long, 11-ft. dia. kiln are removed by running 45-ft. boring bar, 20 in. in diameter, into discharge end of kiln, as seen here.

build a pilot plant able to turn out 500,000 tons of finished product per year using equipment of commercial size, in which the processes developed on a small scale might be tried out. So the Pilotac plant was built. Its capacity, though as large as the combined capacities of the Erie and Reserve pilot plants already built, is only a fraction of that of the commercial plant that ultimately will be built. Construction is now completed. The plant has already handled some taconite and is expected to be in full operation soon.

Please turn to p. 104

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STORAGE OF TAILINGS and recovery of plant water are provided for by construction of this basin, formed on 40-acre tract by building dam 7,200 ft. long with material stripped from mine site. See bottom of p. 100.

Plant Really Big

Pilotac plant comprises three large buildings. The largest, the concentrator, is 306 ft. long by 195 ft. in its main part, with a 128x28-ft. addition containing the coarse tailings bins. The coarse crushing building is 164 ft. long x 50 ft. wide, with a 20x40 ft. extension. Dimensions of the fine crushing building are 129 by 75 ft.

These dimensions alone fail to give a correct idea of size, because depth below surface, invisible to the eye, is in some cases greater than height above. Both crushing buildings are like this. The coarse crusher structure goes 107 ft. below grade compared with a 40-ft. height above to the eaves. And the fine crusher building has a depth of 51 ft. below grade against a height of 35 ft. above the crushing section and 50 ft. over the bins.

The concentrator's main part goes 12 ft. below grade and 82 ft. above to the eaves. The part over the coarse tailings bin is 30 ft. below grade compared with a 77-ft. height above surface.

For Winter Operation

To make 12-month operation possible, walls and roof have been insulated. Space between a double sheathing of corrugated galvanized steel sheets has been filled with spun glass, making a 2-in. layer in the walls and 1½-in. layer in the roof. To date no ore beneficiation plant on the Mesabi has worked the year round, primarily because ore shipments down the lakes are suspended with the advent of cold weather in November, to be resumed when the lakes open up again in March or April.

New Home Sites

As the various taconite development projects on the Mesabi get under way, new jobs and openings will be available with the mining companies. This will mean a growing demand for living quarters. In addition there is the normal growth in Range population. Already new towns or additions to old towns are being planned.

An 80-acre site, south of Mountain Iron, to be called South Grove, has been purchased and laid out by Oliver Iron Mining Division. The land is to be sold for home sites at development cost, Oliver announces. South Grove is within easy driving distance of the Pilotac plant and the agglomeration plant at Virginia. The FHA and local village and county officials have cooperated.

Facts From Concentration Flowsheet

FEED. Crude taconite from mine by diesel-locomotive-hauled train to 350-ton bin of coarse crushing plant.

COARSE CRUSHING. From bin by pan conveyor to jaw crusher taking up to 7-ft. slabs and set to 10 in. Minus 10-in. taconite to gyratory set to 4½ in.

FINE CRUSHING. Minus-4½-in. material by conveyor to two stages of crushing and screening—first to two gyratories set to 2½ in., then to two similar crushers set to ¾ in.

STORAGE FOR CONCENTRATION. Minus ¾-in. taconite to six 1,000-ton bins, in three groups of two each for three respective parallel concentrating lines. Three lines will be operated independently, permitting comparison of results of changes in equipment in different lines.

CONCENTRATION IN EACH LINE. (See foregoing paragraph.) Minus ¾-in. feed to rod mill grinding to minus 1/10 in. —to primary magnetic separator (cobber). Coarse cobber concentrates pumped to ball mill for regrinding, thence to bowl classifier, overflow of which goes to finishing magnetic separators, where fine iron is separated. Finisher separator tailings go to 150-ft. thickener for recovering water, thickened underflow being pumped to tailings basin. The coarse tailings from primary magnetic separators or cobbers (45-50% of cobber feed) are dewatered in spiral classifiers and sent in railroad cars to dump.

FILTRATION. Finisher magnetic separator concentrates are thickened and filtered on drum-type filter. Product of filter goes to bin—to railroad cars for delivery to agglomerating plant.

POWER. Approximately 80 hp. per hr., it is estimated, will be required to produce a ton of taconite concentrates. Power is purchased from utility company. It is received at 110,000 v. and stepped down to 4,000 v. and 440 v., according to use.

WATER. A huge amount of water will be required in beneficiating taconite. Water supply is carefully conserved, water being recovered in plant operation wherever possible to be used again.

A basin formed by enclosing a 40-acre tract with a dam approximately 7,200 ft. long has been provided for impounding tailings and recovering water. The water is pumped to a clear water basin holding 22-million gal. Latter supplies the 1-million-gal. elevated tank at the Pilotac plant (see picture, p. 100). To build the dam 1½-million cu. yd. of earth stripped from the mine site was used, plus enough clay to make it impervious.

Make-up water needed at the plant, despite these measures, is obtained partly from a reservoir in the old Iroquois pit nearby, which also receives rain water and seepage from other Oliver surface mines, partly from West Two River, from which some water is diverted with State permission.

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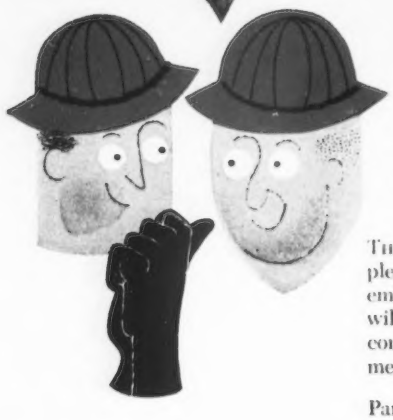

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at FOLSOM DAM

THE FOLSOM DAM project is a big construction job. When completed it will be 340 feet high, 1400 feet long – with wing embankments extending for more than two miles. The new dam will provide a source for irrigation and power, and serve to control flood conditions in the American River Basin near Sacramento, California.

Part of the construction work involves the excavation of more than 9 million cubic yards of earth and rock. Here's where Crucible Hollow Drill Rods are playing a mighty important role. They can't be beat when it comes to hard rock drilling operations.

Crucible Hollow Drill Rods are made to tool steel standards by the world's largest producer of tool and other special purpose steels. This *extra* quality assures you of minimum rod breakage . . . and fewer valuable bit losses. For dependability in rock drilling, buy Crucible Hollow Drill Rods.

CRUCIBLE first name in special purpose steels

53 years of *Fine* steelmaking **HOLLOW DRILL ROD**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

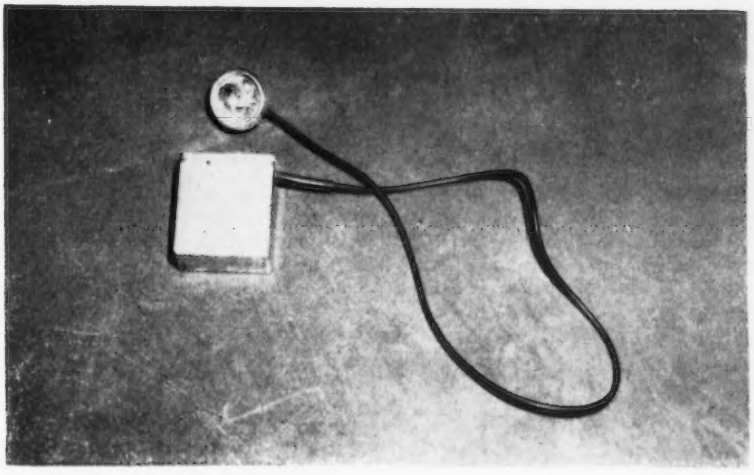
E & M J

NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card–insert and mail.

PREVIEW

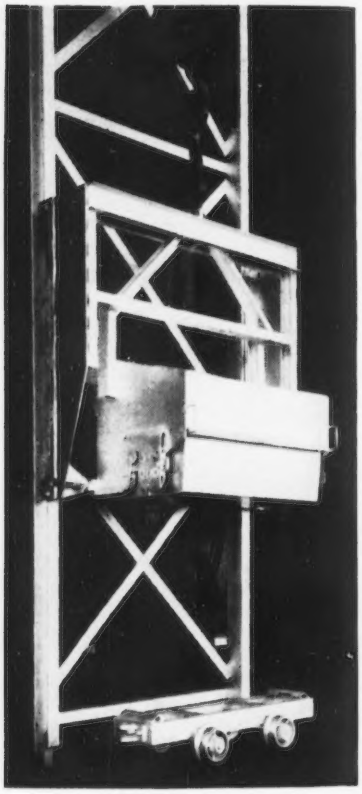
Nickel-Cadmium Battery Promises Longer Life, No Maintenance (1)



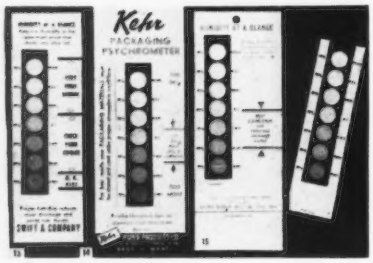
A RECHARGEABLE DRY CELL nickel-cadmium battery for cap lamps, which the manufacturer claims has a substantially longer life than conventional batteries now used, and requires virtually no maintenance, may soon be made in the U. S. The nickel-cadmium battery is used in French mines now and can be purchased in France for use in U. S. However, the manufacturer, Cogenel, Inc., is negotiating for U. S. Bureau of Mines approval of the battery for use in coal mines, and plans to build a factory here.

Advantages of sealed rechargeable dry cell besides long life and low maintenance, include low internal resistance and no gassing in charging. If a miner misses a shift, there is no need to "burn down" the lamp as the unit cannot be overcharged.

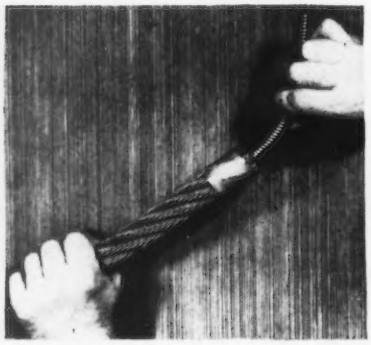
Cogenel, Inc. has an office in New York. For further information on the nickel-cadmium battery, circle No. 1 on the self-addressed reply card opposite p. 110. Fill in your name, address and position and mail. No postage is required. (1)



SELF-DUMPING GILLEY is designed for hoisting muck box in small shallow shafts. Guides fit close to walls leaving room for manway. Mayo Tunnel & Mine Equipment, Lancaster, Pa. (2)

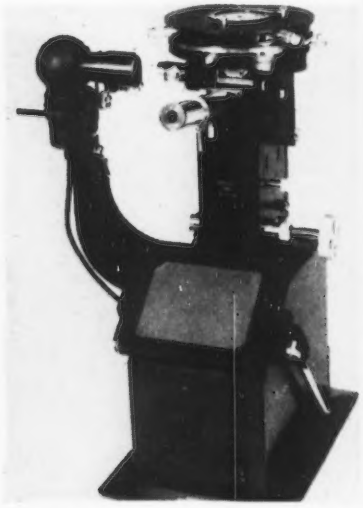


"HUMIGRAPH" has indicator spots that change from blue to lavender to pink to show changes in relative humidity. Fast, simple indicators cost only a few cents. Andrew Technical Service, Chicago. (3)



WIRE ROPE has a core of coiled spring to flex and resist crushing. Designed primarily for rotary drilling rigs, new principle was developed by Jones & Laughlin Steel Corp., Pittsburgh. (4)

PERSONNEL LIFT, designed to give a man 100-ft. reach is entirely controlled by one man from operator's platform on boom. Swings 280 deg. Mobile Aerial Towers, Inc., Fort Wayne, Ind. (5)



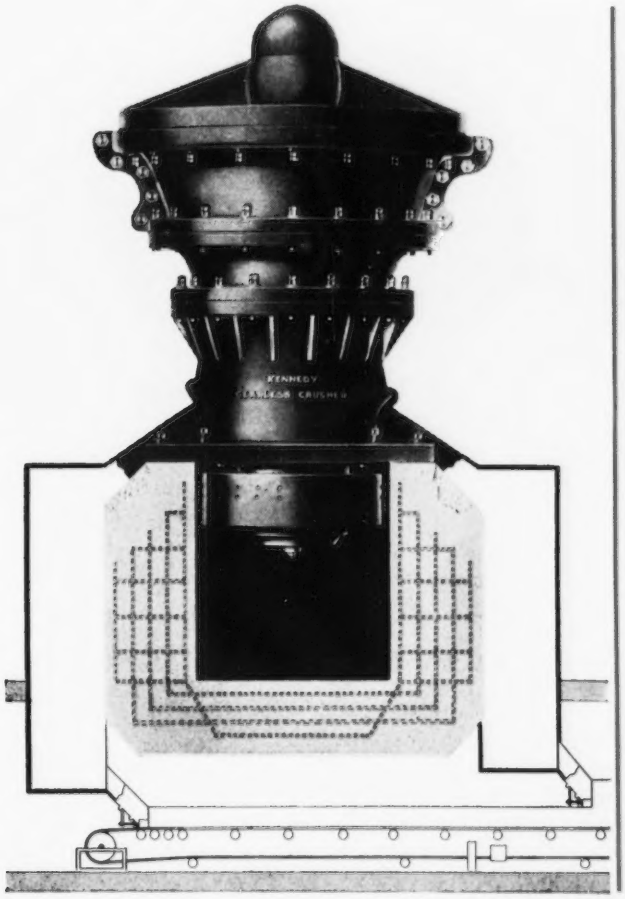
CAMERA MICROSCOPE takes 3¼ x 4¼-in. or 4 x 5-in. black and white or color film with magnification from 4.5 to 2000X. Turn knob for bright, dark field, polarized light or photo. William J. Hacker & Co., Inc., New York. (6)

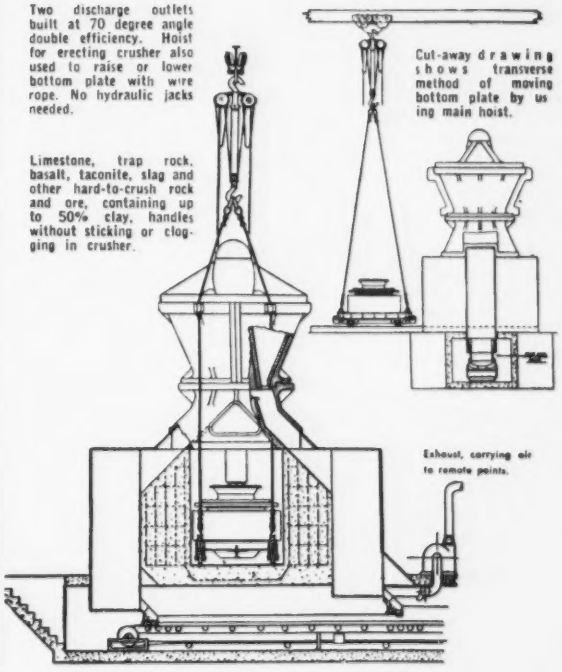
BOX CAR LOADER can handle up to 80 tph of bulk material up to 2 in. in size. Operator can load and trim car without entering it. Thrower pivots to reach all corners. Stephens-Adamson Mfg. Co., Aurora, Ill. (7)

HALF-YARD SHOVEL with twin dipper stick features ball bearing turntable which eliminates rollers and center pin, for fast, smooth swing. Little Giant Crane & Shovel, Inc., Des Moines, Iowa. (8)

KENNEDY PRESENTS THE GREATEST IMPROVEMENT
in gyratory crusher performance in a generation!

NEW DOUBLE DISCHARGE GEARLESS GYRATORY CRUSHER WITH TWO OUTLETS . . . *ENDS THE "STICKY ORE" PROBLEM!* Double discharge outlets built at 70 degree angle solve "sticky ore" problem! Easily crushes ore containing as high as 50% clay without clogging. Synchronous motor built into pulley assembly for sure crusher starting even when full of rock and ore. Gearless construction, frictionless operation. All moving parts carried on self-aligning roller bearings. Power is used only for the actual crushing. Economical recirculating forced-feed oil system. Automatic power shut-off. Primary, secondary types for any tonnage and sizing requirements.




Two discharge outlets built at 70 degree angle double efficiency. Hoist for erecting crusher also used to raise or lower bottom plate with wire rope. No hydraulic jacks needed.
Limestone, trap rock, basalt, taconite, slag and other hard-to-crush rock and ore, containing up to 50% clay, handles without sticking or clogging in crusher.
Cut-away drawing shows transverse method of moving bottom plate by using main hoist.
Exhaust, carrying air to remote points.

IT COSTS LESS.. TO OWN THE BEST!

KENNEDY - VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
FACTORY DANVILLE, PA.

Is your haul road paved with dollar bills?

A poor haul road might as well be surfaced with your money. Nothing wastes your profits quicker. It will slow trucks and increase repairs. It will cut down loads and increase hauling time so your cost-per-ton skyrockets.

But a powerful Caterpillar Motor Grader can change that picture. With frame and power train designed and built to match engine capacity, you get the toughest work done quickly. A blade that stays put, a constant mesh transmission, and unobstructed visibility make Cat* Motor Graders the operators' choice.

It will be your choice, too, because you get more and better work done when the machine and operator work together.

The 100-horsepower Cat No. 12 Motor Grader above keeps the gravel pit haul road of Marquette Cement Manufacturing Co. at Oglesby, Ill., smoothly ready for all traffic. In addition, this all-around work horse ditches and does general chores around pits and dump areas.

One source of responsibility for engine and frame means savings for you. Your Caterpillar Dealer is always ready to serve you. Ask for a demonstration and you'll see why 99 per cent of all Cat Motor Graders built are still in use – still making money for their owners.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks – ®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

Equipment Shorts

MICROWAVE TRANSMISSION. The world's first use of microwave transmission for operating railroad switches, signals and interlockings will occur on the 90-mi. railway now under construction to haul iron ore from U. S. Steel's Cerro Bolivar mine in Venezuela to the harbor at Puerto Ordaz. The electronic equipment was developed by Union Switch & Signal division of Westinghouse Air Brake Co. in cooperation with Radio Corporation of America. It is expected to be in operation when the railroad is completed this fall. **(31)**

PORTABLE AIR SAW. Ingersoll-Rand Co., New York, N. Y., announces a new portable air-powered circular saw with a maximum depth of cut of 4⅜ in. The S-12 air saw has more than enough power to handle all jobs within its capacity range. The saw blade is driven through a simple spur gear drive. The motor is close to the center of the saw giving a well-balanced, easily-handled saw. By simple adjustments of a hand screw and thumb screw, the depth and angle of cut are readily changed. **(32)**

CARGO HANDLER. A patented machine, Cargo Handler, is designed for the automatic handling of coal, cement, sand, gravel, crushed stone, ore, and other bulk materials. It consists of an automatic feeding mechanism built integral with an elevator to feed a system of conveyors for distributing or stockpiling material. The automatic self-feeding mechanism consists of scrapers operated by controlled hydraulic power units which scrape the material into the buckets of the elevator which, in turn, conveys the material up to and onto a horizontal belt conveyor in the boom. The material then is conveyed to the stockpile, storage, yard, bins, or other containers. Cargo Handlers, Inc., Van Dyke, Mich. **(33)**

SHUTTLE CONVEYOR. A conveyor which provides the "missing link" in continuous mining has been developed by Hewitt-Robins, Inc., Stamford, Conn. Although designed for coal mine operation, it is adaptable to all kinds of mine and quarry use. Extendable to 600 or 700 ft. by a rope haul, the new conveyor can follow the progress of mining while maintaining a fixed discharge or transfer point. It may receive material directly from the mining machine or from an intermediate unit such as a shuttle car, conveyor or loading machine. With a minimum belt width of 24 in., the conveyor handles up to 250 tons per hour. It is manufactured in lengths up to about 500 ft. centers. **(34)**

FIRE HOSE. A lightweight fire hose promises to make firefighting a safer, easier job for most firemen in the near future. Called "Highflex" and developed by the B. F. Goodrich Co., Akron, Ohio, 100 ft. of the new hose weighs about 20 lb. less than the same length of standard hose. Dacron, a synthetic fiber woven into the fabric hose cover, makes the new hose so light, flexible and easy to rack that a standard fire truck can carry about 500 ft. more hose than its normal load. **(35)**

EXHAUST VENTILATORS. Corrosion-resistant exhaust ventilators for use in plants and laboratories are now produced by the American Agile Corp., Bedford, Ohio. These exhaust ventilators are fabricated throughout from Agilide (unplasticized polyvinyl chloride) which offers high structural strength and outstanding chemical resistance to most corrosion vapors encountered in industrial operations, including nitrous gases. Agilide exhaust ventilators are of fully welded construction, and are available in four different sizes, ranging in capacity from 250 to 1670 cfm. They are furnished with motors. **(36)**

HYDRAULIC HOSE. A line of high-pressure hydraulic control hose has been developed by Quaker Rubber Corp., Division of H. K. Porter Co., Inc. Phila. Capable of withstanding pressure up to 5,000 psi., Quaker's hydraulic hose is reinforced with fine, high-tensile steel wire to give maximum flexibility and burst resistance under shock loads. This flexibility is retained at temperatures from —40° to 250 deg. F. The rubber tube is especially compounded to resist all popular hydraulic fluids. **(37)**

METAL DETECTOR. A tramp metal detector especially engineered to meet the needs of quarries, coal mines, and other mining type industries for the protection of crushing machinery has been developed by the Industrial Equipment Section, Radio Corporation of America. The new equipment consists of two units—the detector itself framing the aperture through which will pass the conveyor carrying the product being inspected, and a small control unit. The aperture is completely weatherproof to permit outdoor operation. Inspection coils are adjusted so that the equipment will detect any pieces of tramp metal, magnetic or non-magnetic, large enough to damage the crushing machinery, but will not stop operations for small unobjectionable metal objects. **(38)**

HARD FACING. A hard surfacing welding rod claimed to give equal, and in some cases better, wearing results than even tungsten type rods, has been announced by Rankin Manufacturing Co., Los Angeles, Calif. The new rod is called Ranite "F". The rod may be applied in the conventional manner or used with a newly developed procedure to obtain better results. **(39)**

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after October 1, 1953, if mailed in the U.S. or Canada.

Engineering and Mining Journal—August, 1953

NOT GOOD AFTER OCTOBER 1, 1953—if mailed in U. S. or Canada.

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	31	38	45	52	59	66	73	80	87
2	9	16	23	32	39	46	53	60	67	74	81	88
3	10	17	24	33	40	47	54	61	68	75	82	89
4	11	18	25	34	41	48	55	62	69	76	83	90
5	12	19	26	35	42	49	56	63	70	77	84	91
6	13	20	27	36	43	50	57	64	71	78	85	92
7	14	21	28	37	44	51	58	65	72	79	86	93

My Name ..... Position .....

Company .....

Address .....

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

STEEL WIRE. A 20-page booklet of technical data on the application of stainless steel wire has been published by Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Tables of physical properties, corrosion resistance, and analysis are included to help the reader in considering the various types. (51)

CONDUIT. First of its kind to gain Underwriters' Laboratories approval for use in wet locations, "Sealtite" flexible liquid-tight electrical wiring conduit is described in 4-page illustrated publication. Suggested applications, specifications are included. Bulletin UA-530 is available from American Brass Co., American Metal Hose Branch, Waterbury, Conn. (52)

GEAR MOTORS. Function, design, and application of gear-motors are described in a new publication available from the General Electric Co., Schenectady, N. Y. Designated as GEA-1437H, the 16-page, two-color-information guide describes the standard types of G.E. Tri-Clad gear-motors with ratings from ⅛ up to 200 hp. Cut-away photographs show the relative position of the parts which are distinctive to the design of each motor. Adaptability to low-speed jobs and adjustable speed drives are explained along with a description of gear-motor maintenance. (53)

PUMPS. Catalog M-5101, published by Vickers Inc., Detroit, Mich., provides latest specification and engineering information on Vickers hydraulic vane type pumps and motors, valves, power steering pumps and steering boosters, and other oil hydraulic units specifically designed for equipment in the automotive, materials handling, construction machinery, and mining industries. (54)

INDUSTRIAL CASTINGS. Meehanite castings for industry are described in an 8-page folder published by the American Brake Shoe Co., New York, N. Y. The booklet describes characteristics of the material, lists properties, and carries engineering information on hardenability, section strength, and comparative properties of other cast metals. Typical applications are pictured and a table of standard bar stock sizes is included. (56)

FLOOR RESURFACING. A two-color brochure describing low-cost Mastic floor resurfacing by United Laboratories, Inc., Cleveland, Ohio, explains in detail all necessary proportions for mixing, along with ingredients specified for certain jobs. Featured in the bulletin are the low-cost advantages of such materials along with suggested uses, both as a new surfacing over old concrete or wood floors as well as an underlayment for leveling floors prior to the application of tile, linoleum, etc. The material is claimed to withstand heavy loads inside or out. (57)

LUBRICANTS. Bulletin 100, an 8-page, 2-color catalog which describes in technical detail the various industrial grades and compositions of Molykote Lubricants, is now available from Alpha Corp., Greenwich, Conn. Included in the catalog is complete technical information on two of the newest industrial grades: Type U, a grease consistency mixture for extreme bearing pressure lubrication at temperatures ranging from —40° F. to approximately 400°F.; and Type 77, a grease consistency mixture processed with a high grade silicone fluid and stabilizer. Technical information is also included on the standard line with prices, packaging data and ordering instructions as well as a detailed description of this new principle in lubrication. (58)

SLAG HANDLING. Recognizing the scarcity of reference literature on the design, construction, and use of cinder pots in slag handling, a 20-page technical bulletin on Johnston corrugated cinder pots has been published by Mackintosh-Hemphill Co., Pittsburgh, Pa. (59)

PHOTOCOPIES. Photocopies of any office record can now be made by one machine in less than a minute without developing, washing, fixing or drying. Transcopy Duplex makes finished, photo-exact, positive copies of any record regardless of type or color, from originals up to 14½-in. wide in any length. Extremely small, light and compact, Transcopy Duplex takes not much more space than dictating equipment. No special installation is required—the machine operates after being plugged into any electrical outlet. No darkroom is needed. Details are given in Booklet No. P344 offered by Remington Rand Inc., New York. (60)

TRACTOR. A 28-page booklet in color, describing and picturing the Le Tourneau Tournatractor, a high-speed, electric control, rubber-tired tractor available with 10 interchangeable attachments, has just been issued by R. G. LeTourneau, Inc., Peoria, Ill. (61)

INDUSTRIAL CONTROLS. Catalog 8305 describes and illustrates non-indicating electric, electronic and pneumatic controllers for temperature, pressure and humidity, also pneumatic and electric valves, switches and relays. Specifications, dimension drawings, application data and ordering information are included. Minneapolis-Honeywell Regulator Co. (62)

(Continued on p. 113)

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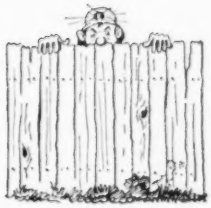
to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, on reverse side, tear out and mail.

CHATTANOOGA, TENN., was the gathering place of 175 Koehring products distributors who were on hand to attend opening ceremonies at the new manufacturing plant of Koehring Southern Co. in April.



By-Products

PROGRESSIVE MANAGEMENT

With the awarding of eleven $500 scholarships to high school seniors, a total of 35 sons and daughters of Allis Chalmers people will be in college next fall under the company's scholarship plan, which has been in operation since 1949. This is the kind of thing there should be a lot more of.

BUSINESS IS GOOD

The Royal Government of his Majesty King Ibn Saud of Saudi Arabia has received 15 trucks from Kenworth Motor Truck Corp. by a special order for use in the royal public works program.

Fifty-one miles of drilling are called for in new contracts awarded Sprague & Henwood, Inc., by the AEC for exploration work in the Colorado Plateau area.

Two 83,000 hp. motors, nearing completion at the East Pittsburgh plant of Westinghouse Electric Corp., are for U. S. Air Force wind tunnels. The monsters stand 21½ ft. high and weigh 225 tons. (In Texas we use them in Mixmasters, pardner.)

More than 100,000 employees worldwide, a peacetime (?) peak, are now on the payroll of Goodyear Tire & Rubber Co., which makes the company one of Uncle Sam's big tax collectors.

RETIRING

William D. Canan after 28 years with Rust Engineering Co.

Carl H. Zieme after 42 years with Lee Rubber and Tire Corp.

W. G. Frome after 40 years with Atlas Powder Co.

E&MJ's congratulations. We hope the fishing is good!

ELECTED

Paul L. Hershfield, as president of Walsh Refractories Corp., St. Louis, Mo.

D. N. Griffin as vice president of Deister Concentrator Co., Fort Wayne, Ind.

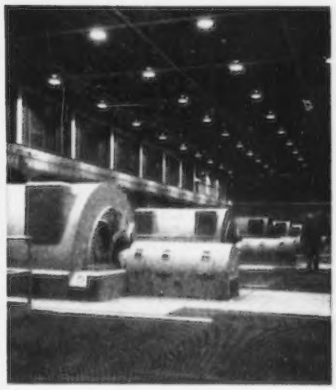
NEW ADDRESSES

Ledoux & Co. has moved to 359 Alfred Ave., Teaneck, N. J. (photograph below). The new laboratory has over twice the floor space occupied in New York City.

Bjorksten Research Laboratories, Inc., is moving the Chicago office and lab to 1525 East 53rd St., Chicago 15, Ill.

what's NEW in Engineering

The "swing and spill" hazard in conventional hook and crane hoisting may soon be a thing of the past, according to a midwestern laboratory. It has developed a new crane which substitutes an automatic mechanism, controlled by a small knob, for the usual operator's controls. The result is a smoother, controlled hoist. So new, this crane is still in scale model stage.



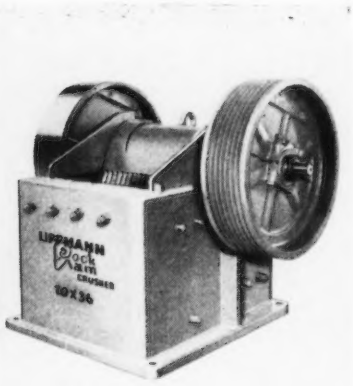
A power plant large enough to serve a city the size of Akron, Ohio, is just part of the nation's largest aluminum reduction plant designed and built by Kaiser Engineers. Installed capacity of the combined gas engine and steam generating facilities is 173,200 kw of power. A maximum of 140,000,000 cubic feet of natural gas is consumed per day. Speed was essential, so Kaiser Engineers had the plant producing power only eight months after groundbreaking. We'll send you an illustrated folder on request.

Instrument Engineering is a valuable new book by Draper, McKay and Lees. In two volumes (the second out this June), it is a comprehensive reference book for the practicing engineer—and an outstanding contribution to the theory of instrument engineering.

Incidentally, Kaiser Engineers has approximately 600 professional engineers, technical experts and staff ready to tackle your problem in design, engineering or construction. Call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

HYDROMUCKER made by Bucyrus-Erie Co., now comes with ½-yd. clamshell equipped with alloy steel lips and teeth. Mucking unit is skid mounted, uses 15 hp. splash-proof motor. Unit needs only 7 ft. headroom. (9)

ONE-MAN CHAIN SAW weighs 30 lb., has 14-in. to 36-in. blades. Gasoline engine with aircraft type carburetor, operates in any position without adjustment. McCulloch Motors Corp. (10)

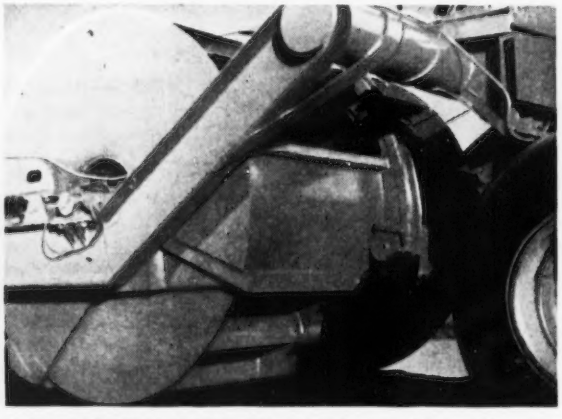


JAW CRUSHERS in new line by Lippman Engineering Works are called Rock-Ram. Available in sizes from 10x16 in. to 30x36 in. For details circle No. 11 on card opposite p. 110. (11)

MOBILE DREDGE can be assembled on land or water in 10 hr. Called "Dredgemaster," an 8-in. unit will handle 200 yd. per hr. through 2,000 ft. of pipe; 10-in. unit, 400 yd. per hr. through 3,000 ft. Georgia Iron Works. (12)

LOW-BED TRUCK with 10-ton capacity and bed only 2 ft. above the ground, offers rapid transportation for your heavy equipment, and easy loading and unloading. Walter Motor Truck Co., Brooklyn, N. Y. (13)

SCRAPERS come in two new models; the 11-yd. TH-B90 and 13-yd. TH-B110, made by Woolridge Mfg. Co., Sunnyvale, Calif. Rubber tired units have hydraulic steering, "boiling bowl" loading, air operated power control. (14)



MILLER ROTARY SCRAPER eliminates drag and pressure by lifting earth away from cutting blade as it scrapes. Steel vanes rolling forward do the job, depositing earth in hopper. Consolidated Distributors, Selma, Calif. (15)

For Your Files *(Continued)*

FLOTATION REAGENTS. Considerable new information on the use of RADA (Rosin Amine D acetate) as a collector for silica and silicate minerals is included in the revised edition of the technical booklet on Hercules Powder Co.'s flotation agents. The booklet gives, briefly, descriptions of the flotation process and the functions flotation agents serve; information on flotation agents supplied by Hercules, and on Hercules activities in developing flotation agents for a wider field of industrial activity; and a group of mathematical formulas widely used in the operation and control of modern ore dressing mills. **(63)**

AUTOMATIC WEIGHING. Sintering Machinery Corp., Transportometer Division, Netcong, N. J., offers a new 8-page bulletin covering the complete Transportometer line of continuous, automatic weighing scales. It consists of three basic models designed to meet any continuous weighing and feed regulating requirements: Transportometer for installation on new or existing belt conveyor; Transportoweigher complete weighing and conveying unit; Transportofeeder complete feed regulating, weighing and conveying unit.

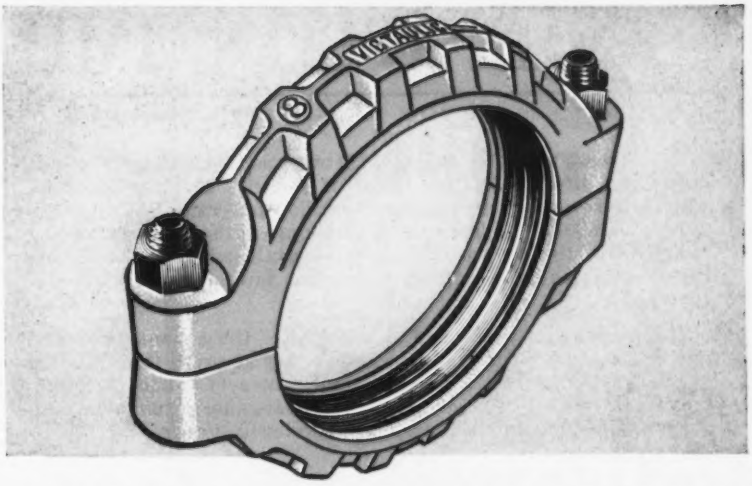
The Transportometer line of automatic, continuous weighing scales employs the only true weight integrator, and unlike other types of continuous weighing equipment, contains no inherent error in its design.

Transportometers, also Transportoweighers and Transportofeeders all employ the same standard, completely mechanical, gear differential weight integrator in their operation. The integrator automatically and continuously records the product of the varying conveyor belt speed and the momentary weight per foot of belt passing over the scale suspension. **(64)**

CONVEYOR BELTS. A 32-page manual on the installation and maintenance of conveyor and elevator belting has just been published by B. F. Goodrich Co., Akron, Ohio. More than 60 photographs and drawings illustrate ways to improve belt service and to lengthen belt life. A chapter on how to select belts includes a discussion of belt design, covers, reinforcements and grades. There is a detailed review of the engineering information required to specify a new conveyor belt. Belt repair methods and belt splicing and fastening are covered in detail. There is additional information too, which makes this an extremely useful manual. **(65)**

DIESEL-ELECTRIC SETS. "Power" is the title of a new 8-page booklet devoted to explaining the efficient and economical use of Diesel electric sets in numerous types of business and industry. The booklet is published by Caterpillar Tractor Co. **(66)**

To get these bulletins, use card opposite page 110.



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WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

The "freeze" on new long-term government purchase commitments was lifted when the Office of Defense Mobilization completed its review of the mining expansion program. But although there's considerable Treasury borrowing authority outstanding for further mining expansion, it's uncertain whether the freeze-lifting will really boost the volume of new metal and mineral contracting.

The nickel goal was hiked as a result of the expansion review and an increase for titanium was pending at press time. Lifting of the freeze may also mean some new contracts in cobalt, columbium-tantalum, beryl, asbestos, mica, manganese, tungsten, and copper—particularly for projects developed under the DMEA program.

No cutbacks have been made yet in outstanding expansion contracts—a potential danger reported here last month. But the threat remains, especially if the fiscal 1954 budget cuts fail to satisfy the more influential economy-minded members of Congress.

Industry itself may initate cutbacks for some projects. DMPA, in its last days was acting tough with several operators who sought more help because, they said, their requirements had been underestimated.

Plans call for GSA's Emergency Procurement Service to absorb what's left of DMPA, although DMPA's charter was extended past the June 30 expiration date. GSA-EPS will ride herd on the outstanding mining expansion contracts, under ODM direction, and will handle negotiations on any new contracting authorized.

Complaints about ODM's lack of direction and indecisive action are coming in from Congressional offices and other government bureaus who deal with the agency on mining matters. Major cause for the situation is Director Arthur Flemming's inability to find an industrialist willing to head ODM's new Office of Materials.

Executives from raw material industries are understandably reluctant to take the job. They would have to sell private stock holdings and expose themselves to a barrage of Congressional criticism when and if investigations of the expansion and stockpile programs are started. Such investigations have been seriously considered for next year.

The administration is steering away from the career bureaucrats for the post.

ODM officials who have the most to say about mining right now, are these part-time consultants: John C. Kinnear, retired vice president of Kennecott Copper; Dr. Alan M. Batman, Yale University geologist; and James F. Brownlee, a partner in J. H. Whitney and Co.

The Tom Lyon Affair

Metal-mining spokesmen in Washington are angry about the outcome of Tom Lyon's nomination to be Director of the Bureau of Mines. They think Lyon was shabbily treated by the administration and see a serious setback for rejuvenation of USBM, which had been eagerly anticipated under Lyon's leadership.

But some of Lyon's friends here concede that the former Anaconda Copper and DMPA official was himself much at fault in the forced withdrawal of his nomination. They feel that Lyon was improperly prepared for his Senate Interior Committee hearing; to a great extent, he simply talked himself out of a job.

The outcome seems especially ironic because: (1) John L. Lewis' objection to Lyon, which had bottled up the appointment at the White House for three months, already had been sidestepped; and (2) Anaconda had previously offered to convert Lyon's revocable pension — which become Lyon's major handicap at the Senate hearing—into a regular irrevocable pension, but Lyon had never bothered to have the change made.

Lyon's opponents emphasized his former connection with Anaconda, implying that this would prejudice Lyon's performance as USBM director. This argument was sheer demagoguery. Lyon's last job with Anaconda had been as general manager of a subsidiary company, and he has never held a policy-making post with the parent company. More importantly, USBM contact with Anaconda is negligible. The agency collects statistics, but has no regulatory authority over metal-mining companies.

Prospects are still strong that USBM will get a metal-mining man as new director. Assistant Interior Secretary (for mineral resources) Felix Wormser has convinced his boss, Interior Secretary Douglas McKay, on this. Leading candidate for the job is Otto Herres, president of Combined Metals Reduction Co., Salt Lake City.

Herres is a one-time coal operator. This should weaken any objection to Herres' appointment by Lewis, who has long impressed Washington with his argument that USBM should be headed by a coal mon.

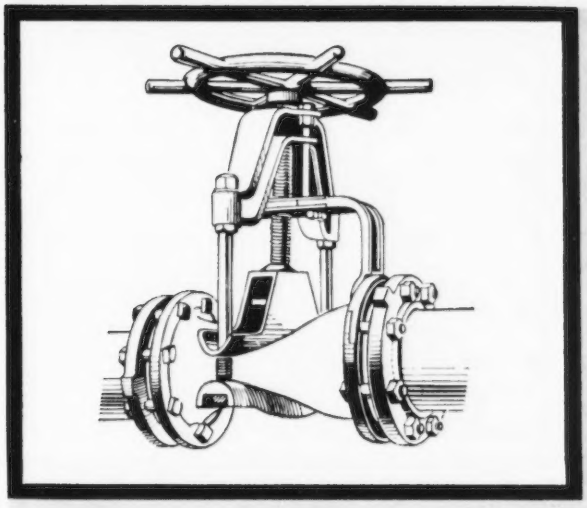
Lewis had demanded that John Forbes be retained as USBM Director. Now it's understood that Forbes has dropped considerably in Lewis' estimation. In Lewis' opinion, Forbes acquiesced too easily when the decision was made recently to close two USBM synthetic liquid fuels demonstration plants.

Bolivian Tin Purchase

Patino, Hochschild, and Aramayo are talking but Washington isn't listening. Instead, Government is now willing to talk turkey about a tin contract with Bolivia's Estenssoro government.

This decision breaks a year-long impasse on the question of committing the U.S. to a tin purchase agreement with a government that had nationalized its mines. The State Department now thinks Estenssoro is our best bet in Bolivia and shoud be backed. If he falls—and the likelihood is great unless he gets U.S. aid—Washington thinks we'd have something worse in Bolivia, a Peron-type dictator or a Moscow puppet. That's the overriding consideration in working out a new tin contract. It's impossible to separate metals from politics in Washington.

Bolivia needs help badly. The country is plagued by food shortages and acute monetary problems. To top it off, there's the headache in tin—normal source of over 70% of Bolivia's income. Since nationalization of the mines, production has fallen off badly. Many foreign engineers have left and there's a lack of replacement parts for mining equipment. (There's talk that a U.S. company may be hired to



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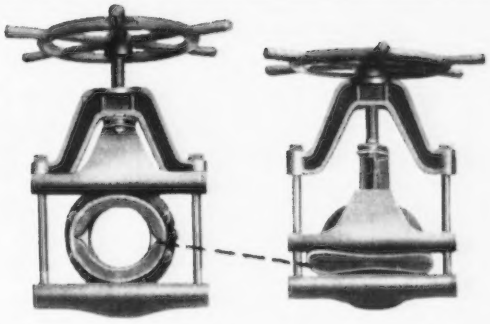

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The sleeve is made of molded natural rubber reinforced with fabric; will withstand pressures to 150 lbs. per sq. in., temperatures to 180° F; freezing temperatures are not harmful.

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REPRESENTATIVES IN FOREIGN COUNTRIES

run the mines.) Add to that the drop in tin prices, and you have a major crisis.

The U.S. offer was made after Estenssoro's recent agreement to compensate U.S. stockholders in the nationalized Patino mines. Arrangements aren't yet clear, but the State Dept. is willing to accept Estenssoro's sincerity. As things stand now, the Bolivian government will put aside a portion of sales from Patino mines to settle claims of the former owners. Still to be determined: The valuation of the nationalized properties. It's likely that a similar arrangement will be worked out soon with Hochschild and Aramayo.

The tin contract is really a minor phase of the U.S. offer. Washington thinks the best way to help Bolivia is to ease its reliance on tin and encourage development of agriculture, transportation, power, food processing, petroleum, and mining of other strategic minerals. Estenssoro has mapped out a four-year program to start such development and seeks investment of $30-million. To help him on his way, he may soon receive another Export-Import Bank loan and International Monetary Fund help to stabilize Bolivian currency.

There were some raised eyebrows in Washington as a result of the State Dept. announcement on tin. The contract is tied pretty much to whether the U.S. government will stay in the tin business. Congress has authorized government operation of the Texas City tin smelter until 1956, but the authorization isn't mandatory. Some Congressmen would like to see the smelter sold to private industry. Whether a buyer could be found, however, is another matter. But the Eisenhower administration's goal is to get the government out of commercial enterprise where possible.

Unless chances of war become stronger, there is little purpose for continued government operation of the smelter. The tin stockpile is in good shape, now, since RFC—which operated the smelter—has been unable to sell any metal at its $1.215 price since March. That's why there's some skepticism about a new tin contract. It's understood the Bolivians want a contract for at least three years at $1.10 a lb. The U.S. offer referred to a one-year contract at an unfixed market price.

RFC officials say they weren't even consulted before State's decision was made. Some are even dubious whether Bolivia has much tin to sell. Since the mines were nationalized, RFC has made two spot purchases of ore to keep its smelter going. The most recent one was in January, 5,000 tons to be delivered by April 30. Bolivia has still failed to ship 500 tons of this purchase.

Bolivia's plan to build its own smelter with Argentine capital collapsed. Experts say Bolivia's low-grade ore doesn't justify construction of a high-cost smelter.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

OUT ON A LIMB: Mine, Mill and Smelter Workers won't shut down the non-ferrous mines this summer. Settlement will be less than 10¢ an hour. Fringe benefits included.

PRODUCTIVITY: Mine-Mill claims to have better figures than the U.S. Bureau of Labor Statistics on copper output per man-hour. A 42% wage increase, Mine-Mill contends, is necessary to give miners the same share of the "value" of their output as they got in 1939.

STEEL WORKERS WORRY REUTHER: The CIO Steel Workers are giving CIO president Walter P. Reuther a few gray hairs. David J. McDonald, new Steel Union president, harbors an intense dislike for Reuther. He met recently with John L. Lewis, boss of the United Mine Workers, who really hates Reuther. Rumors of a possible steel-coal union merger spread like wildfire. It could break up the CIO.

TAX COLLECTORS EYE FRINGE BENEFITS: Treasury Dept.'s tax experts are taking a good look at the 57 varieties of "fringe" benefits employees get outside of their pay envelopes. Most of it is not being taxed as income. But some is. Fringe pay tax rules developed haphazardly. Treasury research staff aims to simplify and clarify them, also plug some holes. Cost of free lunches, free housing, medical service and like benefits may some day be added to worker's pay and thus be taxed.

SOME CURRENT INCOME TAX RULES ON FRINGES:

- Pensions are taxable as income. Where the employee contributes toward the cost of pension, he pays income tax on only 3% of the pension until the exempted 97% equals the amount of his contribution. Then he pays tax on the full pension. Because of normal income tax exemptions, however, few persons have to pay tax on their pensions. Employer contributions to a pension fund are not taxable as income for the employee.
- Hospitalization, health or accident insurance premiums paid by an employer are not taxable income.
- Premiums on group life insurance are not construed as income for the employee unless the insurance carries a cash surrender or loan value.

CIO DRAWS FARTHER FROM EISENHOWER: Gulf between CIO and the Eisenhower Administration is widening. CIO refused to withdraw name of John W. Edelman, a socialist, as its choice for Assistant Secretary of Labor. As a result, the CIO has no voice in the Labor Dept. hierarchy. CIO will step up attack on Eisenhower and Republicans before next year's elections.

AFL DOMINATES LABOR POSTS: Preponderance of AFL men named by Eisenhower to labor posts may drive wedge between AFL and CIO, and help Republican chances next year. AFL-CIO unity prospects are hurt. Major appointments:

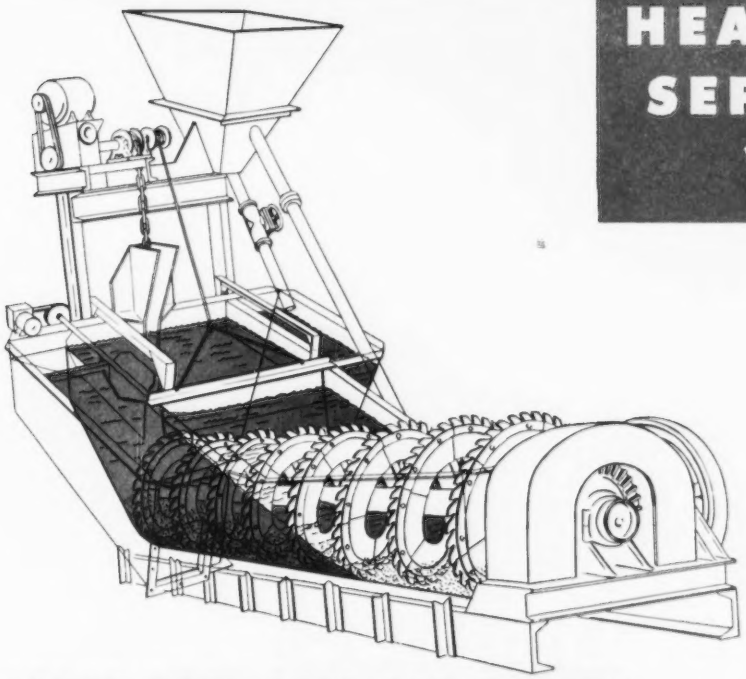
Labor Dept.: Secretary, Martin P. Durkin, AFL Plumbers; Under-secretary, Lloyd A. Mashburn, AFL Lathers; Assistant Secretaries, Spencer Miller, Jr., former director of AFL Workers' Education Bureau, and H. C. Hobart, Brotherhood of Locomotive Engineers; Solicitor, Stuart Rothman, St. Paul attorney.

National Labor Relations Board: Chairman, Guy Farmer, former NLRB staff member and attorney in law office of Louis Johnson, former Secretary of Defense.

Federal Mediation & Conciliation Service: Director, Whitley P. McCoy, Professor of Law at University of Alabama and impartial umpire under various labor-management contracts.

WHITE HOUSE & TAFT-HARTLEY: Eisenhower was slow getting started on Taft-Hartley amendments, and slower getting anything done. Chief reason: How to handle secondary boycotts split Cabinet members Durkin of Labor and Weeks of Commerce.

PROVED ADVANTAGES of AKINS HEAVY MEDIA SEPARATORY VESSEL



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The Akins Separatory Vessel has more pool area and volume per ton capacity than other types of vessels. This results in several distinct advantages:

Longer retention time which, combined with a quiet and deep pool, allows full settling of the sink even from the fine sizes . . . thus giving a better recovery.

Submerged feed assures separation of density fractions.

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PERSONAL NEWS

J. ROY GORDON, whose appointment as vice president and general manager of Canadian operations of the International Nickel Co. of Canada, Ltd., was announced today. He succeeds the late R. Leslie Beattie in both capacities.

JOHN A. MARSH, who succeeds the late Hugh J. Fraser as vice president of International Nickel Co. He has been associated with the company for 25 years and in his new position is in general charge of all U. S. plant operations of the company.

William B. Agocs, formerly head of the Department of Geophysics of the University of Tulsa, Okla., has joined the staff of Aero Service Corp., Phila., worldwide aerial mapping and exploration organization. Dr. Agocs will be available as consultant on airborne magnetometer surveys and other geophysical survey problems.

Oregon Department of Geology and Mineral Industries announces that **Hollis Dole,** geologist, on leave during the past two years for graduate work at the University of Utah, has returned to his post at the Portland office. He has been assigned to the state geologic map project. The opening of chrome mining operations in southwest Oregon will mean resumption of of work by **Len Ramp,** geologist, on the state's chromite study project. He began mapping the operations last year and maintains headquarters at the Grants Pass state field office.

F. McIntosh Galbraith, chief geologist for Day Mines, Inc. for the past 11 years, left that position in July to join Columbia Iron Mining Co., Cedar City, Utah, where he will organize and head up a geology department.

Bert C. Austin has been named president and general manager of Idaho Maryland Mines Corp. to succeed **Albert Crase. Max Bechhold** was elected vice president and assistant to the president and **Henry J. Nelson** was elected to the board. The three new appointees are all from San Francisco.

Dr. H. R. Gault, professor of geology at Lehigh University, has taken a leave of absence to accept an appointment as executive secretary, Division of Earth Sciences, National Research Council, Washington, D. C.

W. N. Taylor, general superintendent at the Red Rose mine of Western Tungsten Copper Mines, Ltd., Hazelton, has been appointed general manager. He succeeds **R. S. Douglas,** who resigned to open his own firm and will continue as consulting engineer for the Western Tungsten firm.

Dr. E. W. Davis, director of the Mines Experiment Station of the University of Minnesota has been honored by the naming of the Reserve Mining Co.'s new taconite processing plant, under construction near Beaver Bay, Minn. The new plant will be called the "E. W. Davis Works."

Cleveland-Cliffs Iron Co. announces the election of **C. W. Allen** as vice president—mining, land and lumbering operations. Mr. Allen was formerly general manager—mining department, with headquarters at Ishpeming, Mich. He will be succeeded by **G. J. Holt,** formerly manager Minnesota mines with headquarters at Hibbing, Minn., who will move to Ishpeming. **H. J. Leach,** formerly superintendent of the Hill-Trumbull mine at Marble, Minn. will take over Mr. Holt's position at Hibbing.

W. W. Simmons is serving as chief geologist for Miami Copper Co., Miami, Ariz.

James B. Colson became chief geologist at the Sunshine Mining Co., at the beginning of the year, succeeding **R. F. Robinson,** whose appointment to a position on DMEA projects was mentioned last month.

Last Chance Gulch Mining Assoc., Helena, Mont., chapter of the Mining Association of Montana elected the following officers for the coming year: **John T. Hopkins,** president; **Donald W. Johnson,** vice president of membership; **Ivor Pounds,** vice president of program; **Hugh K. Gaw,** re-elected secretary-treasurer; **Charles R. Brazier,** re-elected vice president of publicity.

Dr. Truman H. Kuhn, professor of mining geology at the Colorado School of Mines in Golden, has been appointed dean of the college's graduate division. He succeeds **Prof. Clark B. Carpenter,** who retired from the faculty this summer. Dr. Kuhn has been on the faculty since 1942 and has headed the mining geology option since 1947.

Walter A. Hamilton, mill superintendent, **Richard F. Moe,** mine superintendent, and **R. C. Wilson,** smelter superintendent of White Pine Copper Co., have moved to Michigan and may now be addressed in care of the company, Star Route, Ontonagon, Mich.

Russell Salter, who for some years has been connected with various enterprises of American Smelting & Refining Co., is now at the company's Silver Bell project, Star Route, Marona, Ariz.

C. DeWitt Smith has been transferred from the New York operations of St. Joseph Lead Co. at Balmat, where he was superintendent of mines, to the St. Joe New York offices at 250 Park Avenue.

Richard S. Newlin, a director and vice president of Inspiration Consolidated Copper Co., was elected president, and **H. Myles Jacob,** secretary and treasurer, was elected a director. These changes were made to fill vacancies caused by the recent death of

J. M. VAN WINCKLE has been appointed chief engineer of the Quebec Iron and Titanium Corp. He will be located at the Sorel Works of the company. Mr. Van Winckle graduated from the University of Toronto with a degree in mechanical engineering.

For shovel Maintenance

STOODY BUILD-UP

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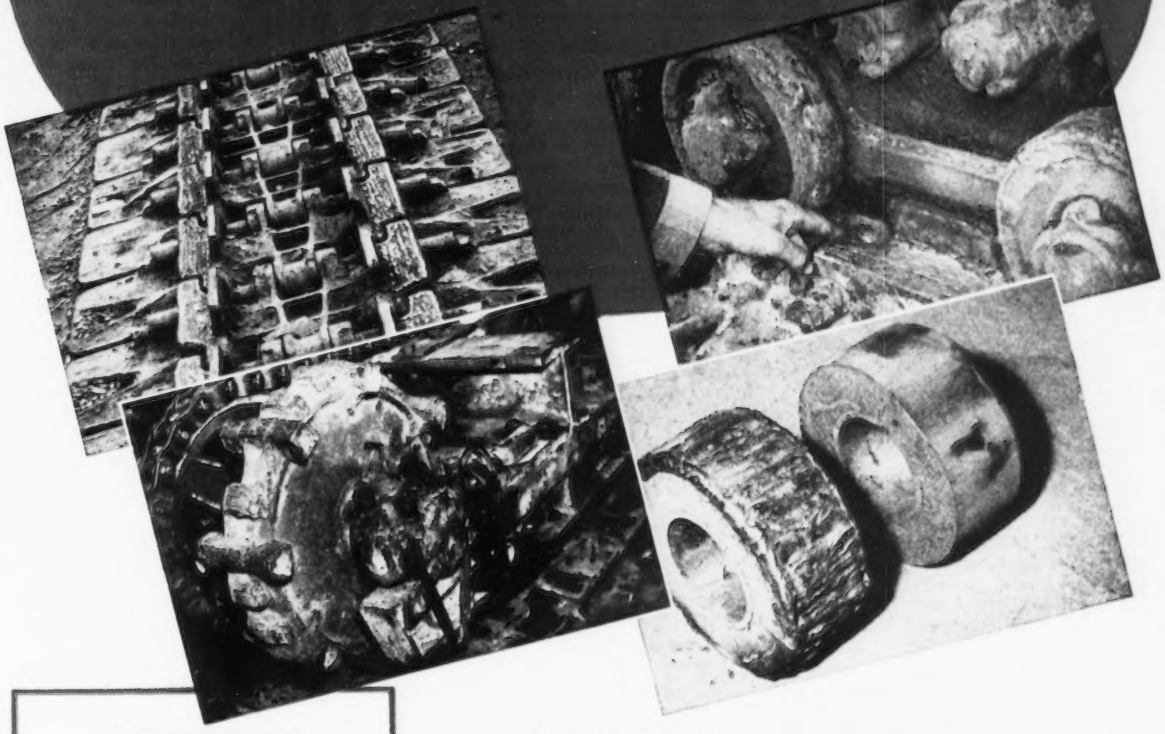

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C. I. BRADFORD (left) has been appointed vice president and director of operations of Rem-Cru Titanium, Inc., leading producer of titanium, jointly owned by Remington Arms Co., Inc., and Crucible Steel Company of America. W. E. GREGG (right) has been named assistant director of operations of Rem-Cru Titanium, Inc. He was formerly assistant treasurer.

William D. Thornton, formerly president and director.

S. K. Droubay has been appointed general manager of the newly organized United Park City Mines Co., a firm resulting from the consolidation of Silver King Coalition Mines Co. and Park Utah Consolidated Mines Co. Formerly manager of Anaconda Copper Mining Co. properties at Darwin and Shoshone, Inyo County, Calif., Mr. Droubay is a graduate of the University of Utah.

L. K. Wilson, geologist for the American Smelting and Refining Co., may now be reached at the San Francisco office of the company. **Kenyon Richard** has been named to succeed Mr. Wilson in the southwest office at Tucson, Ariz.

Foote Mineral Co. announces the following personnel changes. **Ted Evans,** mining engineer and a graduate of McGill University, has been added to the Sunbright, Va., staff as mining superintendent. **Thomas L. Kesler** has jointed the company as geologist. Mr. Kesler holds B.S. and M.S. degrees in geology from the University of North Carolina, and has had extensive experience.

MICHAEL J. GLEASON has been named manager of the contract drilling division of E. J. Longyear Co. Vincent N. Burnhart, who formerly held the post, will become assistant general manager.

Paul F. Armstrong, Canadian mining geologist, left at the end of June for Turkey, as a United Nations technical assistance expert, to help the Turkish Government with field work in evaluating ore deposits, especially chromite lead and zinc, and in prospecting for new mineral reserves. He has been given this one-year assignment in response to a request by the Government of Turkey. Mr. Armstrong graduated from McGill University and has a Ph.D. in economic geology and petrology from Yale University.

Frank E. Foote has been elected assistant secretary of Mine Safety Appliances Co. He has been associated with the company since 1937 and is manager of its legal department.

David A. Goodkind has been elected president of Ringwood Iron Mines, Inc., Ringwood, N. J. Mr. Goodkind was formerly treasurer and director.

Howard W. Jacky is now employed by Anaconda Copper Mining Co. as fluo-solids and acid plant foreman at the Yerington mine, Weed Heights, Nev.

The board of directors of United States Smelting Refining and Mining Co. elected **J. George Gange** vice president and comptroller at its June meeting.

A. F. Franz, president of the Colorado Fuel and Iron Corp., received an honorary degree of Doctor of Commercial Science at the commencement exercises of St. Bonaventure University.

Theodore Marvin, director of advertising for Hercules Powder Co., has resigned to become president of the Michigan Chemical Corp., St. Louis, Mich.

Hon. J. S. McDiarmid has resigned as Minister of Mines and Natural Resources for the province of Manitoba, after serving in that post for 21 years.

Earl Parker, professor of metallurgy at the University of California, Berkeley, has been appointed chairman of the university's Division of Mineral Technology. **L. E. Shaffer,** professor of mining, was named vice chairman.

Robert A. Lovett, former Secretary of Defense, has been elected to the board of directors of Freeport Sulphur Co. He resigned from his government post last January to re-enter private business after a nine-year career in public service.

Victor P. Geffine has been elected president of Cliffs Power & Light Co., Ishpeming, Mich. Simultaneously he has resigned as senior vice president of the parent Cleveland-Cliffs Iron Co. in order to devote a large part of his time to the execution of an extensive power program. The program, is necessitated by Cleveland-Cliffs' development of jasper beneficiation on the Marquette range and to provide for future ore expansion on that range by Cleveland-Cliffs and other companies.

Mr. Geffine has also been chosen president of the Newfoundland and Labrador Corp., Ltd., the mineral and timber development set up and backed by the Newfoundland government.

H. E. Vogt, formerly works manager of the United States Gypsum Co. operations at Heath, Fergus County, Mont., has been transferred to the Detroit plant and is succeeded by **Richard Deneke.**

Basil H. Mason has been named office manager of the El Paso, Texas, plant of American Smelting & Refining Co. His post as chief clerk at the East Helena plant will be filled by **C. G. DeGooyer.**

George R. Powe, Cascade, Mont., has been appointed chief mining geologist of the Northern Pacific Railway,

H. F. DENGLER, export sales manager for International Minerals & Chemical Corporation, Chicago, discussed the world outlook for phosphate in *E&MJ*'s July issue, page 166. His portrait omitted at the last minute by "exigencies of make-up" is presented herewith.

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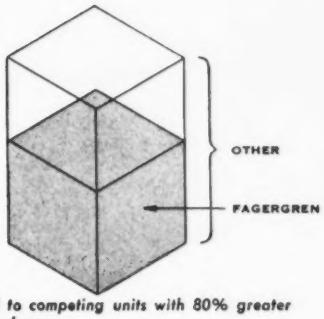
WITH LESS **TOTAL** CELL VOLUME!



1 *Compared to competing units with 80% greater total cell volume*
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+ 2c per ton **metal recovery** over competing units.
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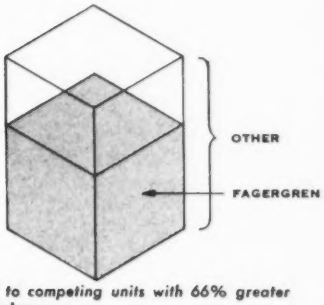
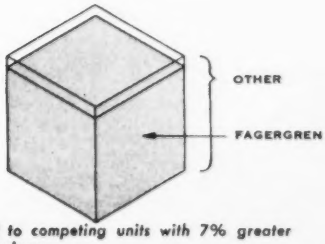


2 *Compared to competing units with 66% greater total cell volume*
• Fagergren superiority is:
+ 2½c per ton **metal recovery** over competing units.
+ 3c per ton **economic recovery** over competing units.



3 *Compared to competing units with 7% greater total cell volume*
• Fagergren superiority is:
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+ 6c per ton **economic recovery** over competing units.

These test results prove Fagergren superiority

- The figures shown here are the results from extensive tests recently conducted by a large mining company. They graphically illustrate that Fagergren Flotation Machines out-perform other machines having as much as 80% more total cell volume. Note also that when the total cell volume of Fagergren units and other machines is more nearly equal, the advantages of Fagergren operation are even more pronounced. These results and other related tests prove conclusively that in terms of lower tailing losses, higher concentrate grade, lower reagent costs and lower smelting charges, Fagergren machines are superior on every count.
- **Fagergren's high metallurgical efficiency** results from the faster rate of flotation achieved by Fagergren's exclusive rotor-stator design. This powerful agitating mechanism produces larger numbers of smaller, livelier bubbles thus increasing the total mineral attachment area. The unmatched efficiency of this pulp aeration and dispersion assures greater capacity per cubic foot with higher mineral recovery. Because Fagergren cells do a better job with fewer cubic feet, substantial savings are possible due to lower investment required, reduced floor space and less operating and maintenance costs.

Write today for descriptive bulletin and information on how Fagergren machines can help solve your flotation problems.

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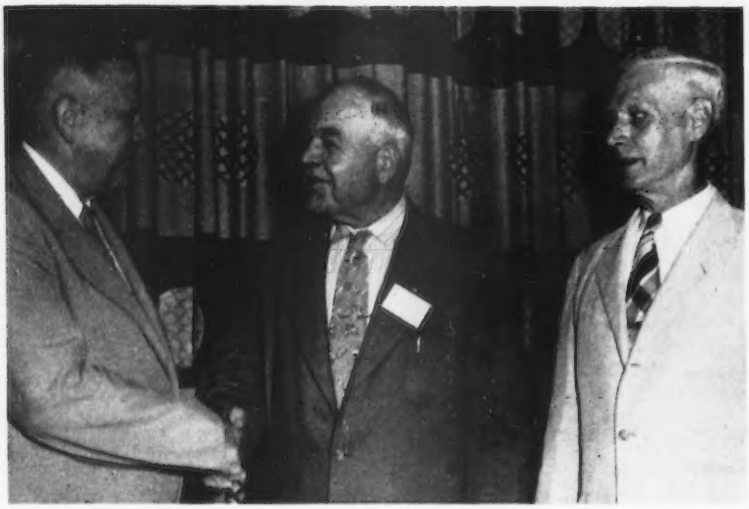


GEORGE H. DEIKE (left) is newly elected president of the Mine Inspectors Institute of America. Mr. Deike, board chairman of Mine Safety Appliances Co., succeeds JOHN M. MALLOY (center), chief of the Oklahoma Department of Mines. JOSEPH BIERER, chief of the West Virginia Department of Mines, joins in the congratulations.

with headquarters in St. Paul. He is a graduate of the Montana School of Mines. **V. A. Gilles,** who has been chief geologist of the company at Billings since 1940, has been named consulting geologist at the same location.

Westl B. Wallace, who has been with the Reclamation Bureau at Boise, Idaho, since 1944, has been appointed administrator for Region 3 of the Bureau of Land Management at Billings, Mont., succeeding **Albin D. Molohon,** recently resigned.

Sydney Nashner has been named technical assistant to the president of Sherritt Gordon Mines, Ltd., Toronto. A graduate of Massachusetts Institute of Technology in metallurgical engineering, he has been responsible for the design of the new Sherritt Gordon nickel refinery at Fort Saskatchewan, Alberta.

M. A. Hanna Co. announces the following appointments: **B. M. Andreas,** general superintendent of the Hibbing district, becomes assistant general manager of the company's Minnesota operations, a post formerly held by **Earl S. Mollard. R. C. Wallace,** formerly superintendent of the Cooley district, succeeds Mr. Andreas in the Hibbing district, while his assistant, **R. C. Crist,** moves into his position as superintendent. **Fred Dyson** will be transferred from the South Agnew mine, where he has been head foreman, to become assistant superintendent in the Cooley district. He is succeeded at South Agnew by **Richard Whitney, Jr.,** of the engineering department. **John Specht** has been promoted to washing plant foreman at the Patrick plant at Cooley, Minn.

N. J. Greenaway has joined the engineering staff of Pickands Mather & Co. at Hibbing, Minn. **Amos Munson** leaves there to become chief clerk in the Cuyuna range district.

Neil L. Hanson, metallurgist, has joined the staff of Rhude & Fryberger at Hibbing, Minn.

U. S. Steel's Oliver Iron Mining Division announces the following appointments: **William N. Matheson,** vice president for sales and planning; and **Lloyd J. Severson,** vice president for mineral development. Both of the newly appointed vice presidents have had extensive experience in mining. **Ronald J. Morton,** concentration engineer, has been named manager of research. Mr. Morton joined the company in 1945 and has devoted much of his time to experimental work on taconite concentration before plans were made for the new taconite plant at Mountain Iron.

District changes in the company have also been announced. **Adolph H. Axelson,** Virginia, has been named assistant chief mining engineer for the eastern district. **Hal E. Brown** has been promoted to assistant chief mining engineer in the Hibbing-Chisholm district.

OBITUARIES

A. R. Long, 80, founder of Long Super Mine Car Co., and one of the nation's leading designers of mechanized coal equipment, died in Miami Beach, Fla., in May.

Charles D. Kerr, 62, Hibbing, Minn., died on June 5th. He was superintendent of the Mesabi Mineral Association fee interests on the Mesabi.

Edward W. Leach, Duluth, Minn., died on May 10 at the age of 66. Mr. Leach was with Pickands Mather & Co. on the Mesabi for many years, retiring in 1945, when assistant manager in the Duluth office. He then engaged in operating, for a time, with the Snowshoe mine at Crosby and the Sullivan mine at Virginia, and was also manager of the Leach Exploration Co. of Duluth, until 1952.

G. Chester Brown, 73, former chief state mining engineer of California, died of a heart ailment June 21 in Oakland, Calif. He served in the post for more than a decade and originated many of California's mine safety regulations. He resigned in 1927 to become chief of the division of mines and oils in the state compensation insurance fund. Later he was executive secretary of the California chapter of the Mining Congress of the United States, a position he held until his retirement in 1945.

LETTERS RECEIVED

South African Uranium—More Credit to Key Men

Dear Sir:

I refer to the excellent article on South African uranium in the May 1953 issue. This includes an account of the "History and Geology in Brief" excerpted from *The Mining Survey* published by the Transvaal Chamber of Mines, March 1953.

This record is incomplete and therefore misleading for the years 1941-1945. I have received several communications urging that the record be amplified. During those years there was a considerable group working in the United States on the occurrence of uranium, including an intensive literature research program under the direction of Joseph Sinclair (since deceased). Mr. Sinclair's staff came upon R. A. Cooper's paper in their systematic search of the world's literature. As a result samples of the heavy residues of many of the individual Rand mines were obtained in the field in the early summer of 1944. An extensive report with assays was written by Weston Bourret, who was in charge of the field work. This was the first report that recognized the potentialities of the Rand reefs for the production of uranium and supplied quantitative data to support the conclusions presented. Several engineers and geologists, principally R. H. Ridgway, were active in the supervision of this work. Dr. Bain was aware of the results but was not responsible for the carrying out or direction of the project.

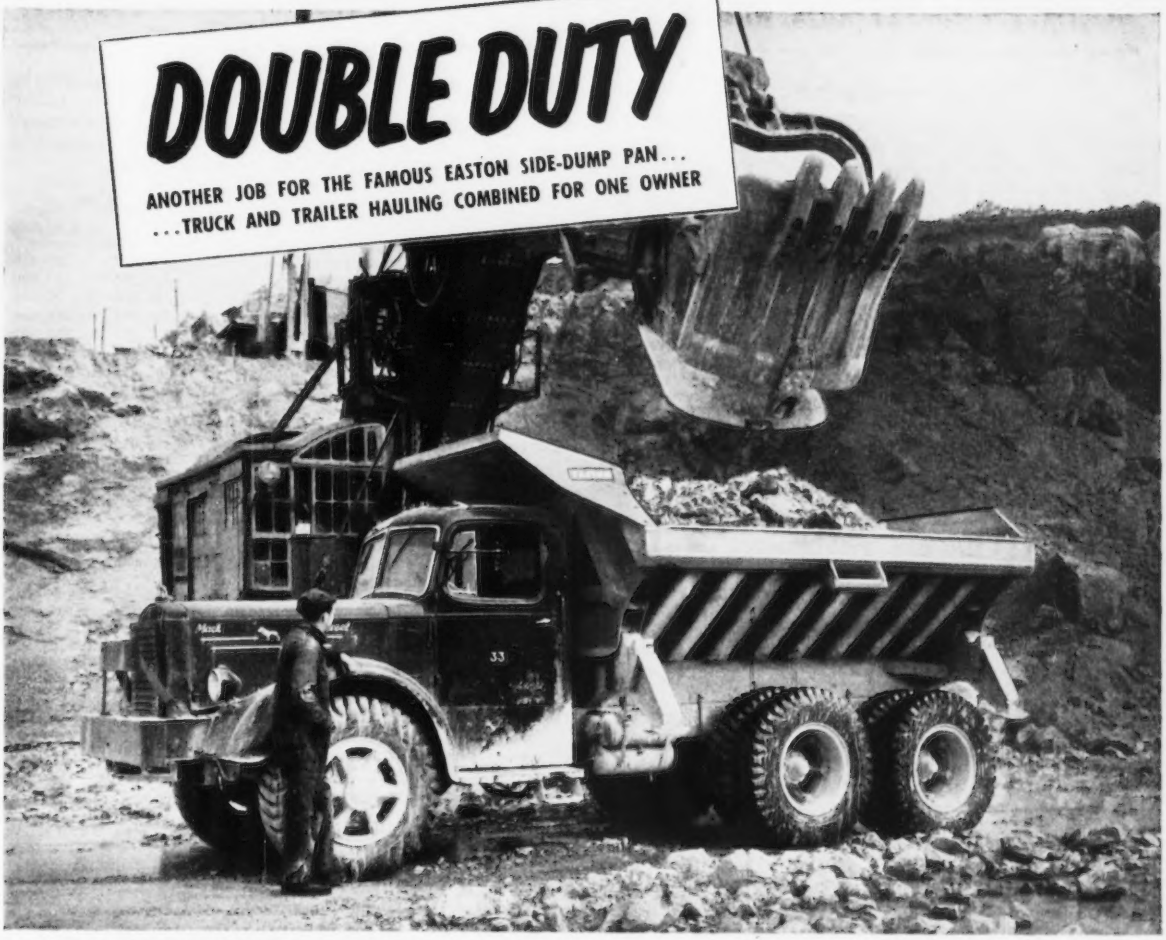
I am sure that Dr. Bain will welcome this amplification of the record since his report mentioned in the article was based on the work described in this letter.

Sincerely yours,

OSCAR W. JARRELL,
Consulting Geologist
Needham, Mass.

DOUBLE DUTY

ANOTHER JOB FOR THE FAMOUS EASTON SIDE-DUMP PAN...
...TRUCK AND TRAILER HAULING COMBINED FOR ONE OWNER



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but only a side-dump can do this

▼ **DOUBLE THE PAYLOAD** — the dump body teamed with an EASTON TP trailer for another haul on the same property

YOU GET LOWEST COST PER TON when your haulage system is custom-fitted to your property. Fortunately, a qualified EASTON haulage survey costs you nothing. Why not take advantage of EASTON's broad experience? Write today.

EASTON CAR & CONSTRUCTION COMPANY · EASTON, PA.

EASTON

 (*Continued from page 69*)

Tungsten Output and Imports Rise

Domestic production of tungsten concentrates in the first quarter of 1953 reached the highest quarterly rate since 1944, according to the Bureau of Mines. Consumption increased 12% over the preceding quarter and was at the highest quarterly rate since the fourth quarter of 1951. General imports in the Jan.-March period were 25% greater than in the preceding quarter.

A summary of the statistics of tungsten ore and concentrates, quarterly averages, in short tons of 60% WO_3(a), follows:

	U. S. Mine Output	Imports (b)	Consumption
1949	761	1,643	1,303
1950	1,041	4,242	1,733
1951	1,554	1,675	2,997
1952	1,792	4,578	2,268
1953:			
1st Quarter	2,123	6,897	2,412

(a) One short ton of 60% WO_3 contains 952 lb. of tungsten. (b) Imports for consumption.

Domestic production of tungsten concentrates in the first quarter comprised 1,384 tons of scheelite-type concentrates and 739 tons of wolframite-type ore.

Distribution of tungsten concentrates consumed in this country during the months of February and March of the current year, by major uses, was as follows:

Steel ingots and ferrotungsten	25%
Hydrogen-reduced metal	41%
Carbon-reduced metal, chemicals, and miscellaneous products	34%

Based on preliminary information, consumption of hydrogen-reduced tungsten powder in the production of wire, rod, and sheet absorbed approximately 30% of the supply. Tungsten carbide production used nearly all of the remaining 70%, and in addition consumed other tungsten-bearing material.

Imports of tungsten ore and concentrates entered for consumption in the first quarter of 1953 were about 50% greater than the quarterly average for 1952. Imports, by countries, in pounds, were as follows:

	Gross Weight	Tungsten Content
Argentina	330,577	168,219
Australia	525,731	265,036
Belgian Congo	46,734	25,666
Bolivia	1,606,247	766,596
Brazil	1,235,476	699,209
Br. E. Africa	44,539	24,274
Canada	1,549,355	432,898
Finland	32,136	15,933
France	167,550	86,376
Hong Kong	32,400	16,980
Korea, Rep.	1,578,093	767,499
Mexico	638,255	212,321
Peru	470,228	263,764
Portugal	1,333,339	743,721
Spain	1,754,872	932,639
Thailand	828,037	475,624
Union South Africa	15,804	9,435
United Kingdom	15,000	7,732
Totals	12,204,373	5,913,922

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

July 31, 1953

Aluminum ingot, 99 plus percent, lb.	21½¢.
Antimony, spot, lb., 5 tons and up but less than carload, packed in cases	37.97¢.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.40
Germanium, lb.	$340.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60¢.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢.
Palladium, troy oz.	$23.00 @ $24.00
Platinum (Official quotation wholesale lots) troy oz.	$93.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$190 @ $192
Selenium, 99 plus percent, lb.	$4.25 @ $4.75
Silicon, minimum 97 percent, carloads, lb.	18½¢.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, lb.	$5.00

(a) Include U.S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$46.00 @ $48.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $32.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $56.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer (b)	$10.30
Mesabi bessemer (b)	$10.05
Mesabi, non-bessemer (b)	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$173.70
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.18 @ $1.21 c.i.f. U.S. ports, duty extra. Long-term contract nominal at 90c. to 93c., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60¢.
Tantalite, 60% concentrate, per lb.	$2.50 @ $3.00
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, c.i.f. U.S. ports	$42.00 @ $43.00
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$65.00

(a) F.o.b. port of shipment. (b) Effective July 1, 1953.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½¢.
Cobalt Oxide, 72½ to 73½%, ceramic grade, per lb.	$1.82 @$1.84½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24½¢.
Ferromanganese, 74–76%, net ton, seaboard	$200
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent per lb. of contained Si	12.4¢.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.35
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	11.4¢.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$85.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Sh ngle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $14.00
Missouri, 94 percent $BaSO_4$, per short ton	$12.00
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$42.50
60% effective CaF2	$38.00
Acid 97% concentrate, bulk, ton	$60.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$39.56
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 80 to 85¢.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	30.00

(a) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$62.00
Structural shapes, 100 lb.	$4.10

DOW XANTHATES ASSURE MAXIMUM RECOVERY

Superior collector reagents make separation of sulfide minerals fast and complete... reduce operational costs

Every bubble is loaded to maximum carrying capacity when Dow Xanthates are on the job. Improved results are easy to measure in greater recovery and higher concentrate grade.

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To learn more about Dow Xanthates and the savings they can effect in your milling operation, write to THE DOW CHEMICAL COMPANY, Midland, Michigan, *Dept. OC 3-36A.*

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OPERATING IDEAS

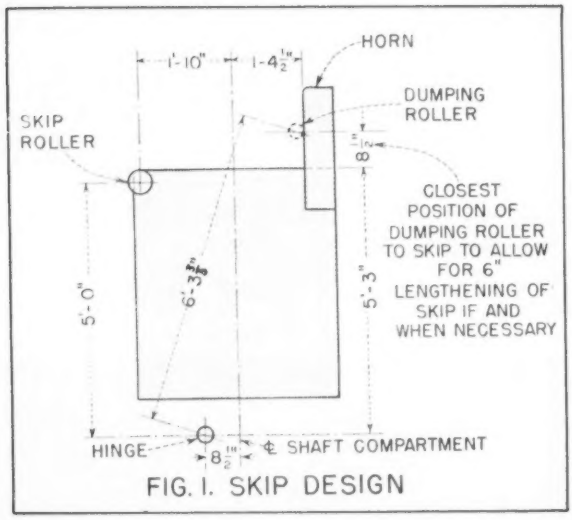
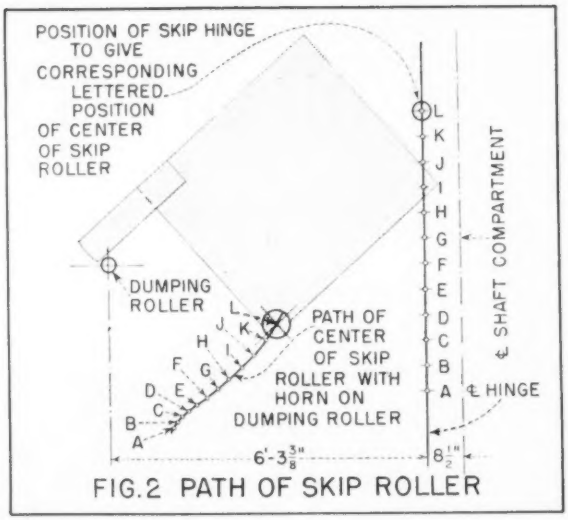


FIG. 1. SKIP DESIGN


POSITION OF SKIP HINGE TO GIVE CORRESPONDING LETTERED POSITION OF CENTER OF SKIP ROLLER
DUMPING ROLLER
PATH OF CENTER OF SKIP ROLLER WITH HORN ON DUMPING ROLLER
℄ SHAFT COMPARTMENT
℄ HINGE
A B C D E F G H I J K L
6'-3⅜"
8½"
FIG. 2 PATH OF SKIP ROLLER

Improved Skip-Dumping Plate Design

SEVERAL YEARS AGO, A. F. Horle, engineer, Mexican Mining Department, American Smelting and Refining Co., El Paso, Tex., made a study of dumping characteristics of Kimberley-type skips. He noted that there was generally a jolt when the skip roller came in contact with the dumping-plate rails on the down trip of the empty skip—also a jar when the dumping roller picked up the load on the up trip. Further investigation showed that the path of the skip roller was such that a smooth transfer of load on the down trip could not be expected when a horizontal track on the dumping plate was used, unless the lowering speed was kept at absolute minimum.

After plotting the path of the skip roller while the horn was on the dumping roller, Mr. Horle recognized certain obvious steps which had to be taken to remedy skip dumping performance. Here are the steps:

In conventional dumping plates a horizontal track is usually present near the end of the maximum horizontal extension of the skip roller. This should be discarded, and the track curve continued to beyond the horizontal.

Fig. 1 shows a small skip of the Kimberley design on which some controlling dimensions are given.

Fig. 2 shows the path of the center of the skip roller when the horn is on the dumping roller. Note how the track falls away from the horizontal. This permits the load on the skip roller to be picked up more or less tangentially at point "c" on the down trip.

Fig. 3 shows one approach to the actual selection of the track radii, and location of their centers. The figures chosen may vary widely. But it is important to choose dimensions that will give nearly tangential approaches, and that will allow easy construction of the dumping plates in the field. The angle of approach of the dumping roller to the bottom track on the down trip may be slightly greater than that of the roller to the upper track on the up trip. As an additional check on the velocity and angle of approach of the horn to the dumping roller, the horn location may also be plotted for varying skip positions.

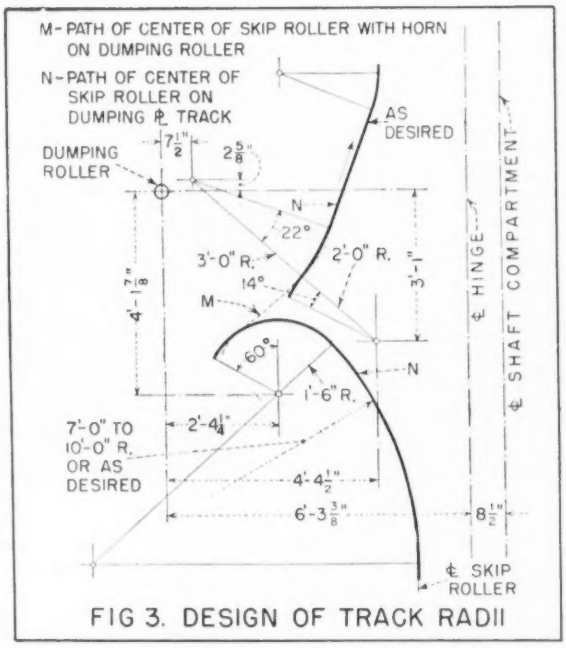


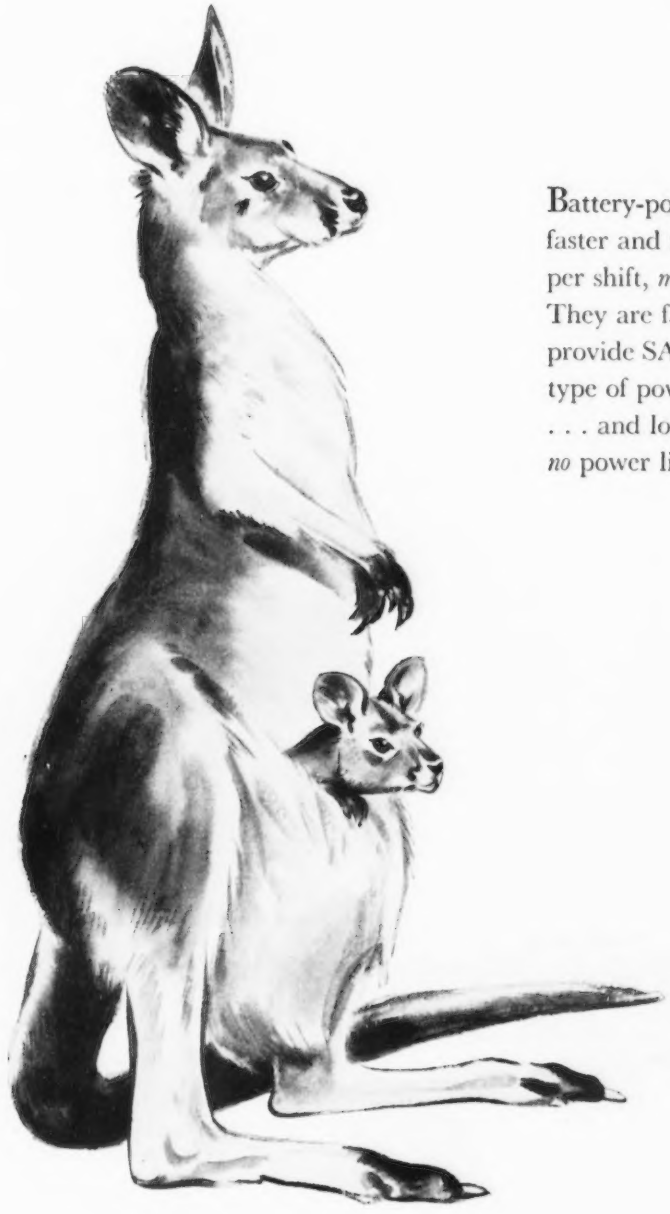
FIG 3. DESIGN OF TRACK RADII

In all cases the position of the dumping roller is located first to give the desired clearance with the skip. Then the position of the dumping roller is used as a reference point for the rest of the design. (In many cases it is the practice to draw the lower dumping rails first, and then determine the dumping roller position from the locus of the horn.)

Once the desired travel position of the center of

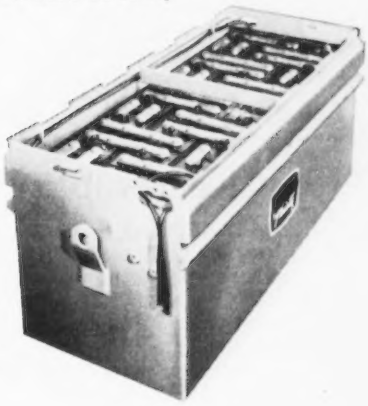
EXTRA LOAD-CARRYING CAPACITY

THANKS TO BATTERY POWER!



Battery-powered shuttle cars travel faster and farther . . . make more trips per shift, *move more coal at lower cost.* They are far more maneuverable and provide SAFETY possible with no other type of power. For mine shuttle cars . . . and locomotives . . . there's *no* power like Gould Battery power!

Specify
THE GOULD "THIRTY"—
America's Finest
Mine Shuttle Car Battery



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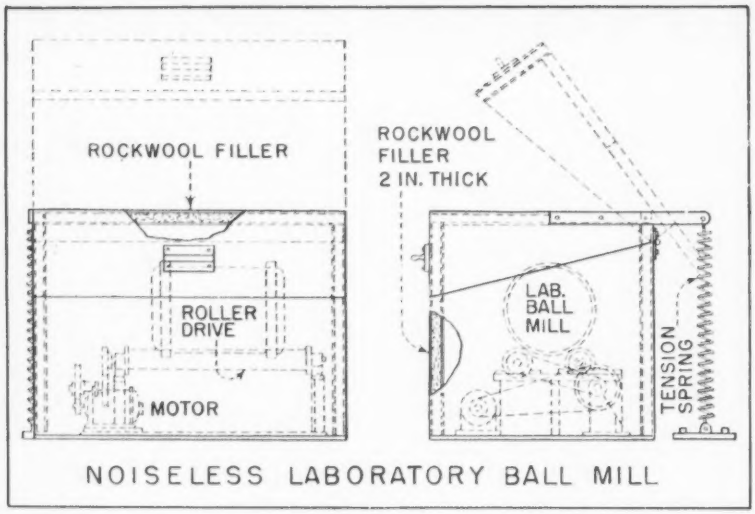
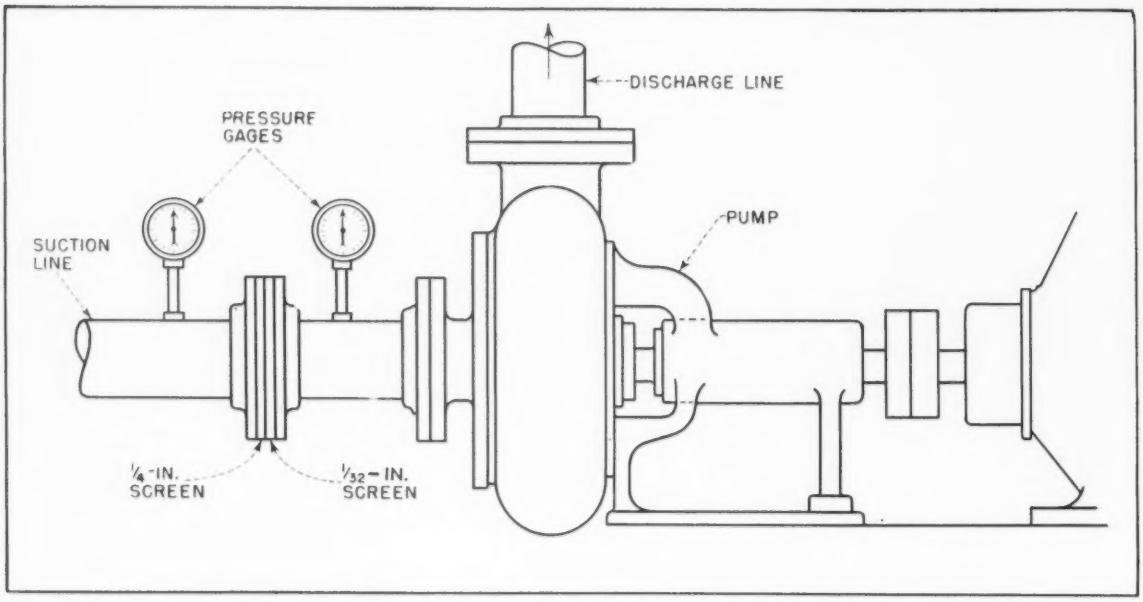


NOISELESS LABORATORY BALL MILL

Noiseless Ball Mill

AT THE TEMPORARY laboratory building of the research department of Kennecott Copper Corp., Salt Lake City, headed by Stuart R. Zimmerley, a small ball mill for test runs proved to be excessively noisy. E. E. Malouf, member of the research staff, eliminated about 90% of the noise by enclosing the mill, motor, and roller drive mechanism in the sound-insulated box shown at left which he designed and built. The top and walls of the box are insulated with a 2-in. filler of sound-absorbing rockwool. The long tension spring shown in the drawing enables the ball-mill operator to open and close the box with little effort.



Removable Suction Screens Protect Pump

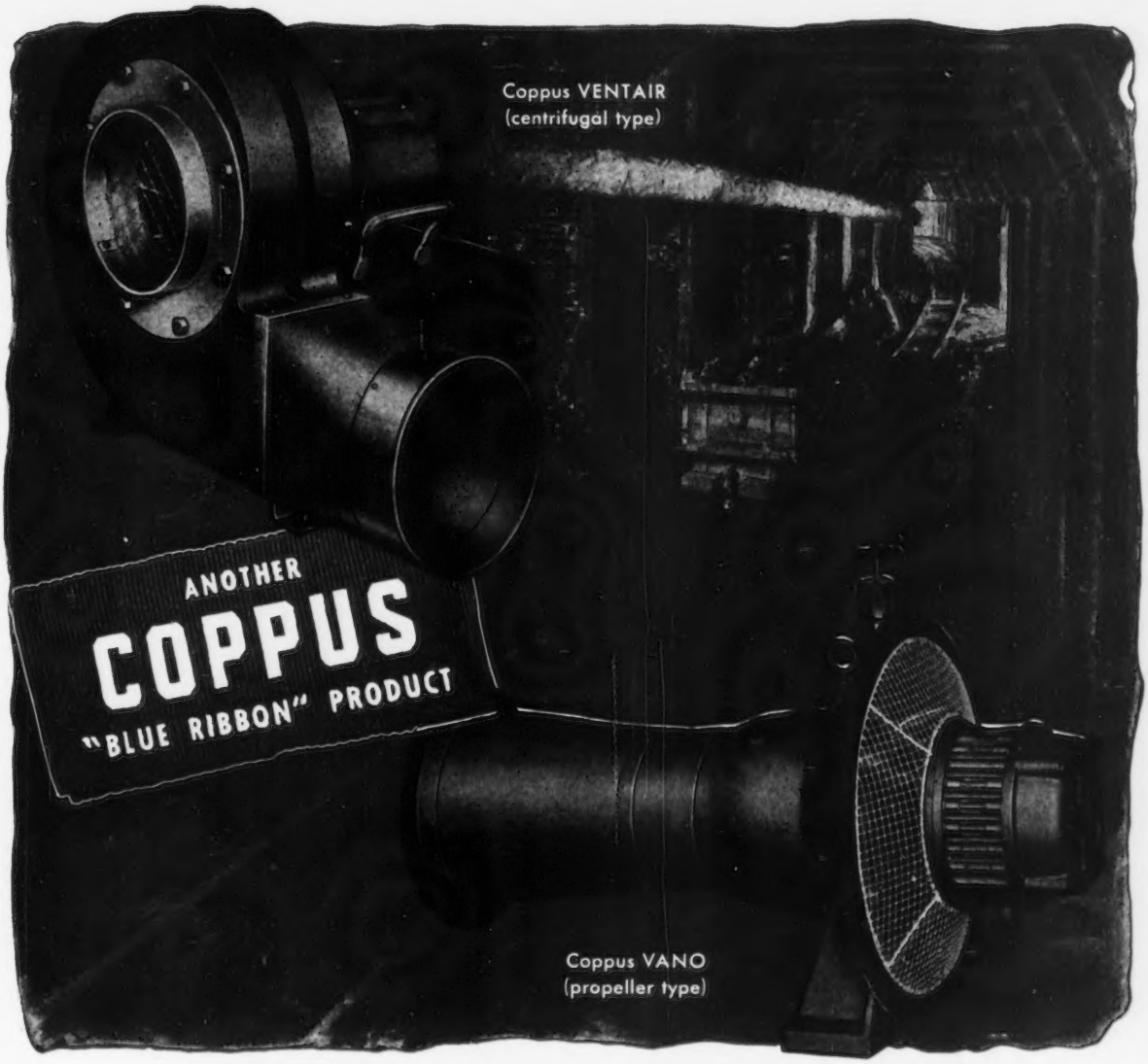
FOREIGN MATTER, sand, and scale will remain in small quantities in pipelines during assembly despite the best of precautions to eliminate them. When this foreign matter gets into the pumps during initial operations, it may cause trouble and wear. A western lead-zinc mine combats this problem by installing screens on the suction side of the pump as shown here. The two suction screens are inserted between the flanges of the suction line near the pump intake—one made from ¼-in. screen cloth, the other of 1/32-in. mesh. Pressure drop through them is indicated by two pressure gages connected to the suction line—one on either side of the screens. An increase in pressure difference means that the screens are being clogged and need cleaning. In general screens can be removed permanently after one cleaning.

Skip-Dumping Design *(Continued)*

the skip roller is determined, it is easy to locate the track at a distance equal to the radius of the skip roller from the center travel position, where necessary.

For smooth entrance into the dumping plates, the track radius should be as large as possible where the skip begins to move from the vertical on the up trip, and it is very important that the radius be large for shorter skips. This is necessary in order not to increase the angular velocity when shorter skips are used. The radius should also be greater for higher velocities than for slower speeds.

Application of the foregoing principles in the design of dumping plates has resulted in jolt-free and virtually noiseless performance of skip-dumping assemblies.



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Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, Worcester 2, Mass.

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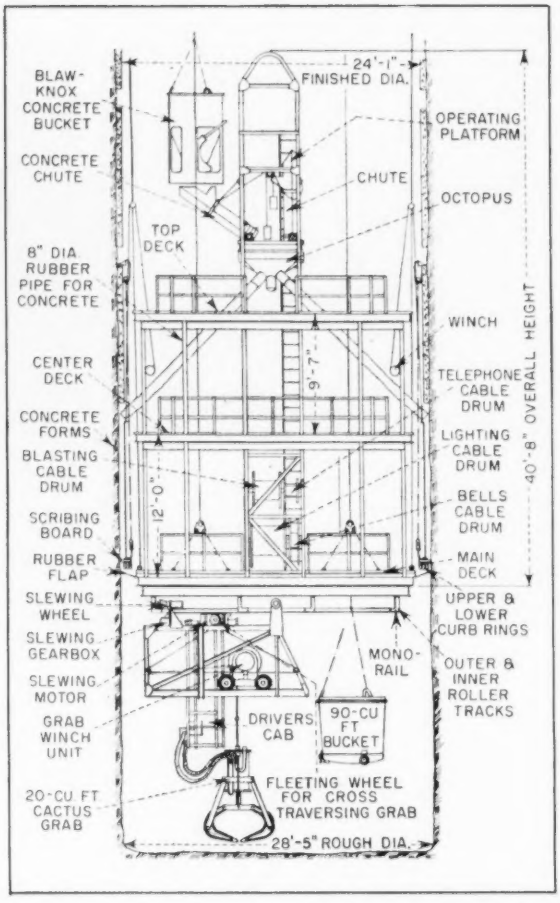
MUCH OF THE SPEED achieved was due to this multi-leaf mechanical mucker used in the shaft sinking cycle.



A THREE-DECK SHAFT SINKING STAGE facilitated mucking and concreting in the 24-ft. dia. circular shaft.

Vlakfontein Sets World Record For Shaft Sinking in May

A NEW WORLD shaft-sinking record was set in May at the No. 2 shaft, Vlakfontein Gold Mining Co. on the Far East Rand, South Africa, when a total of 585 ft. was advanced. The previous record, held by Virginia G. M. in the Orange Free State was 504 ft. advanced in April 1951. Vlakfontein's advance included concrete lining of the 24-ft. dia. shaft at a depth between 3,700 and 4,000 ft.

Record speed is attributed in part to the "cactus"-type mechanical grab (mucking device) used to remove broken rock (see illustrations). This grab doubled the speed of mucking time and required only half the number of lashing boys (muckers) to complete the job.

The air operated cactus grab is based on the Priestman design modified and adapted by New Consolidated Gold Fields engineers. Vlakfontein workshops, constructed the unit. The multi-pointed grab penetrates and gathers fine or coarse rock equally well.

Capacity of the grab is one ton. It will load a 90-cu. ft., 5-ton bucket in about 3 min., and clean and hoist more than 100 tons per hr. Leaves of the grab are tipped with tungsten carbide. The grab is mounted so that it traverses the shaft on a radial arm riding on a monorail attached to the main or lowest deck of the sinking stage.

Sinking and lining operations are run on a three-shift basis. Two, 1-cu. yd. Blaw-Knox concrete mixers, mounted in the headframe, discharge into a common launder feeding into a Blaw-Knox concrete bucket on shaft doors. The bucket is lowered and discharges into an "octopus" which feeds into the space between walls and shuttering (forms).

Concrete forms 11 ft. high ride on a steel curb ring. Concrete is poured during the drilling shift. The lining is broken on 12 ft. 6-in. centers with 18-in. spacings which will carry the permanent steel work of the shaft.

A three-deck sinking stage is used as shown. The monorail and grab assembly are attached to the lowest or main deck which also carries drum cables. The second deck carries the winch which lowers the shuttering. The top deck is used to extend pipes and control distribution concrete. The stage is hoisted by a four-drum Fulton hoist.

The average sinking cycle is as follows: Re-entry period, 15 min.; cleaning, 4-hr; blowing, 45 min; drilling, 1 hr. 15 min.; loading and blasting, 1 hr. 25 min.; average delay, 25 min.; total 8 hr.

The 5-ton sinking buckets are carried on rope guides. This shaft will therefore prove to be the deepest in Africa using rope guides. Vibration and resonance on the ropes present a problem requiring further improvements in design. One solution may be the use of different suspension weights on each of the pairs of ropes. Loaded buckets are tipped by means of a chain hook hanging from the headframe in a 300-ton waste bin.

IN MINING

Plight of Lead-Zinc Mines Causes Government Concern

The Department of the Interior is acutely aware of the current predicament of the metal and mineral producers of the West and it is earnestly seeking an effective answer, Felix E. Wormser, assistant secretary for mineral resources, declared in an address before the Idaho Mining Association on July 13.

Distress among lead and zinc miners is of deep concern to the Administration, he said. After discussions with State Department officials the British Government has decided to reduce the rate of disposal of its zinc holdings and also transfer a substantial tonnage of its zinc accumulations to a strategic reserve stock, he revealed.

Mr. Wormser touched on changes that have taken place in the mining industry over the last 50 years, and added that "our concept of free enterprise has been greatly modified in the last 20 years."

"The whole world has been gradually drifting in the direction of more and more government regulation and control in ways utterly undreamed of only a few years ago, and which would have been considered fantastic when the Idaho Mining Association was born in 1903. The drift has received impetus from the emergencies of three world wars. It is futile to think that this system will change suddenly. We must, therefore, be realistic. We must recognize our environment as one in which the economic and political world is cluttered with the use of devalued and often manipulated currencies, subsidies, direct controls, monopolistic State trading, and other devices of governments to control the economies of nations, not to mention outright socialism, nationalization or expropriation of industry."

Regulation and Control

To illustrate some of the developments that have taken place in the last 20 years affecting the mining industry, he cited the following:

"(1) Almost complete abolition of tariff protection for some metals and minerals.

"(2) Control over the issue of mine securities.

"(3) The imposition of high income taxes, both corporation and personal, also a capital gains tax.

"(4) Use of substantial funds from the Treasury to support mining at home and abroad largely in the interest of defense.

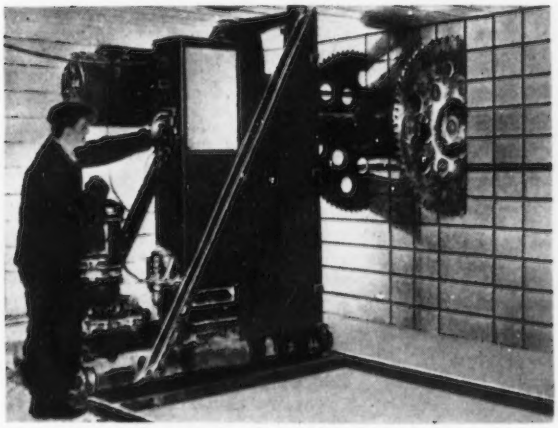
"(5) Use of international allocations, such as the International Materials Conference, participation in the International Tin Commodity Conference, or the suggestion of the Paley Commission that international commodity agreements might be of help to the mining industry.

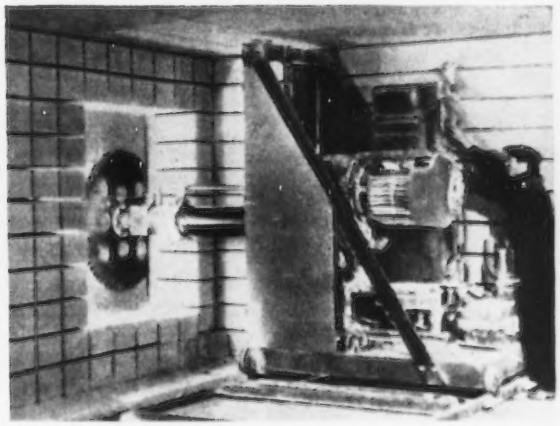
"(6) Tendency of many foreign governments to use managed paper currencies rather than currencies tied to gold.

"Numerous other developments might be cited, but those I have outlined are the most significant to my mind, as bearing on the problems of the domestic mineral producer.

"Normally, the mining industries receive comparatively little Government assistance when measured against the aid to many other segments of our economy. In times of stress, when shortages threaten and the public realizes how basic minerals and metals are, the mining industry obtains help, as it has under the terms of the Defense Production Act."

Continuation of the Defense Production Act has given additional life to the Defense Minerals Exploration Administration so that certain metals which are still needed for defense could be favored by Government assistance.





READY-TO-USE dimension stone is cut with new Soviet stone saw, which cuts vertical and horizontal slices (left), then slices off rear of the stone sections as shown at right. Russians state it was designed for operation by one man.

New Soviet Machine Cuts Dimension Stone

THE SOVIET UNION has started mass production of a new stone-cutting machine designed to cut dimension stone from deposits in place. The unit, called the Galanin cutter, is said to be able to cut enough stone in 24 hours to build 2 two-family houses.

Operated by one man, the machine cuts horizontal and vertical slices in a rock face at the same time. Then after a suitable opening has been made in the face, a third saw cutting at right angles to the two previous cuts, slices off the back of the stone sections, and they are ready to use for construction. The blades can be set at any angle to increase the versatility of the unit. Nature of the cutting blades was not disclosed.

(More News on page 132)

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for Power Transmission to avoid Costly Shut-Downs

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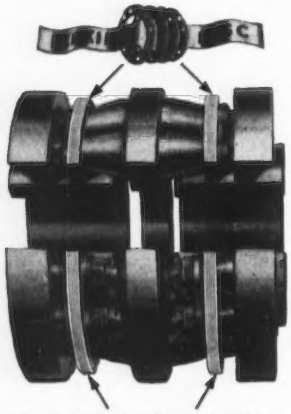

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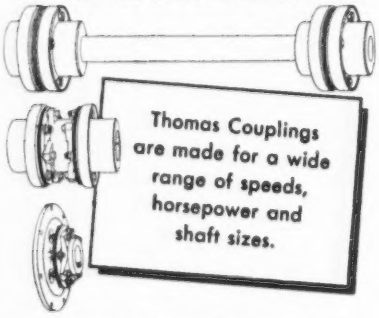

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Rare-Earth Elements Improve Properties Of Certain Steels

THE RARE-EARTH ELEMENTS—a group of metals including cerium and lanthanum with limited industrial use until now—do valuable work in improving the rolling and forging properties of certain stainless steels, according to C. B. Post, chief metallurgist and H. O. Beaver, metallurgist, of the Carpenter Steel Co.

There are 15 elements, found largely in the mineral deposits of the Carolinas, Florida, Idaho, India, Brazil and more recently in the deposits of southern California, which are called collectively "rare-earths." Experiences within the last two or three years have shown that the most important of these in steelmaking are cerium and lanthanum. They may be added to steel in the form of mixtures called misch-metal or as rare-earth oxides.

Messrs. Post and Beaver delivered a paper at a meeting of the American Iron and Steel Institute in which they described experiences with rare-earth oxides and with "misch-metal" containing rare-earth elements. Two to 12 pounds of misch-metal per ton of stainless steel were added to the ladle as it was filled with molten metal from the steelmaking furnace. The misch-metal was in the form of two-pound cast pigs, wired to a bar and plunged beneath the surface of the metal when the ladle was about two-thirds full.

Several mixtures of the rare-earth oxides also are used as ladle additions to stainless steels for the purpose of improving the rolling and forging properties. These ladle additions are of the order of one to four pounds per ton in the case of certain inherently ductile steels.

The difference between the effects of adding misch-metal and rare-earth oxides to stainless steels is that the former process leaves small amounts of cerium and lanthanum contained in the steel and actually corrects any poor rolling properties, while the latter leaves no trace of the elements in the steel and simply improves existing hot-working properties, the authors said.

To Speed Titanium Deliveries

PRODUCERS AND FABRICATORS of titanium will be asked to speed up deliveries of metallic titanium and semi-manufactured products to military contractors, spokesmen for the Government told members of the industry's advisory committee at a recent meeting in Washington.

A lag in deliveries during May and June was attributed to a shortage in titanium sponge metal, the raw material from which commercial shapes are manufactured. Production of the metal is being increased and output for 1953 is expected to total 3,400 tons. The Government's expansion program calls for production of 18,600 tons by 1956.

Asbestos Firm Plans Black Lake Production

LAKE ASBESTOS of Quebec Ltd., a subsidiary of American Smelting & Refining Co., is awaiting authorization to put into production property at Black Lake belonging to United Asbestos Corp.

Expenditures bringing the property to production reportedly have been estimated at in excess of $15-million. Plans and specifications for draining of the lake have not been completed. However, preliminary plans have been filed with the Quebec government and Lake Asbestos of Quebec Ltd. is awaiting a satisfactory order-in-council before proceeding, according to unofficial sources.

French Firm to Develop Africa Manganese Mine

COMILOG, a French firm, has discovered and is preparing to develop an extensive high grade manganese deposit in French Equatorial Africa. U. S. Steel has a 49% interest in Comilog.

Comilog officials estimate that the property contains some 50-million tons of the manganese ore, of a grade comparable to high grade Russian ores.

U. S. Steel pointed out, however, that the deposit is located about 250 miles inland, and that it would be several years before the property could be readied for production.

Brazilian Beryl Deal

SIGNING OF A CONTRACT designed to help develop new sources of beryl in South America for United States defense and industrial needs was announced last week by the Defense Materials Procurement Agency. Beryl is used principally as an alloying element with copper. It is in short supply.

The new contract is with the firm of Proberil, S.A., Rio de Janeiro, and calls for the development of several beryl deposits in the State of Minas Gerais, Brazil.

DMPA has an option under the contract on $150,000 worth of beryl at a price of $50 per metric ton unit of BeO contained in concentrates, f.o.b. Brazilian port. DMPA will advance the company up to $50,000, to be repaid with interest as production proceeds, to help get the project under way.

IN THE U. S.

ALASKA

★**Quebec Metallurgical Industries** has contracted to spend at least $75,000 before the end of 1953 on mineral development of the Klukwan "Mountain of Ore" in the Haines area.

Claims to the huge ore body, unofficially estimated to contain several billion tons of ore ranging from 10 to 72% iron, were obtained from the C. T. Takahashi Co., which previously leased the claims for the Alaska Iron Co.

QMI reportedly is obligated to spend at least $150,000 a year on exploration of the magnetite orebody and on technical and economic studies for a steel plant in the area. It is understood to be associated with Frobisher, Ltd., which has announced plans to investigate hydroelectric and industrial potentials of the Yukon Basin. QMI also has announced that it will study sites for smaller hydro developments on the upper Chilkat River.

ARIZONA

★**Recently discovered ore pockets** at the BS&K Mining Co. properties in Pinal County run 27% zinc and 14% copper. But because of the low market, company plans are for exploration now, rather than production. A. M. Kalaf, company president, said plans provide for future daily production of 100 tons of ore to run 56 to 60% zinc and 27 to 30% copper when milled and concentrated by selective flotation. BS&K holdings adjoin the property of the Silver Bell mine operated by American Smelting and Refining Co.

★**An Arizona court decision** has ruled that assets of Sonoyta Gold Mining Co. in Sonora, Mex., will be turned back to company investors. The company operated for more than a year under a court-appointed conservator. After the conservator was appointed a rich vein of gold was uncovered. The Arizona court decided that since the tangled affairs of the company now are straightened there is no need for further litigation.

★**Two asbestos exploration projects** have been started in the Globe area under DMEA contracts. One for $14,000 has been signed for work 14 mi. east of Globe. The other for $26,975 covers work at the Mystery deposit located on the San Carlos Indian Reservation.

★**San Manuel Copper Corp.** in Pinal County of central Arizona has signed a contract with Arizona Public Service Co. to construct a 21-mi. $350,000 power line to the new San Manuel mine and townsite. The 115,000-v. line will run from Oracle Junction to the site of the town of 7,000 popula-

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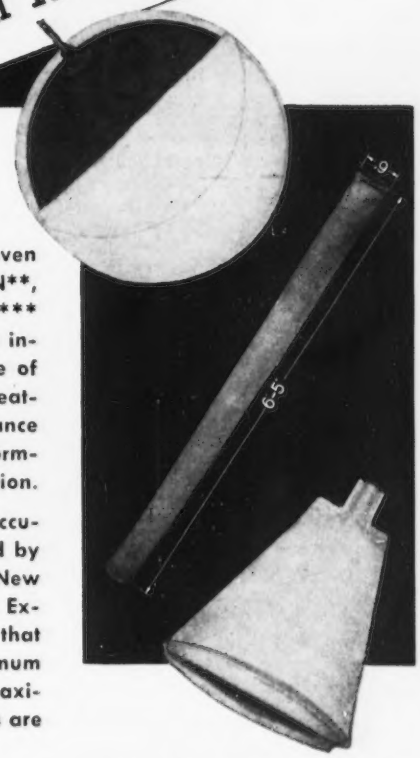

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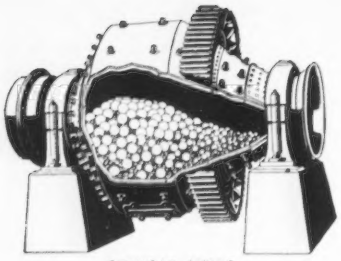
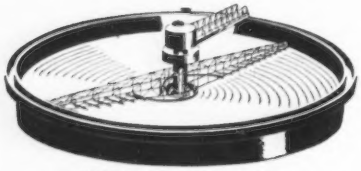
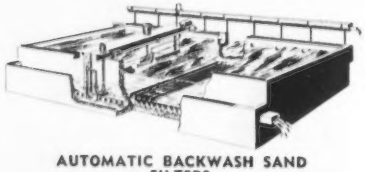


CONICAL MILLS

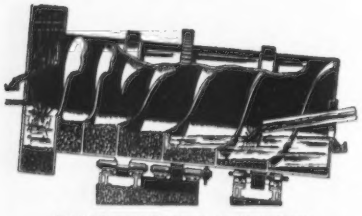
SINGLE-SHELL ROTARY DRYERS



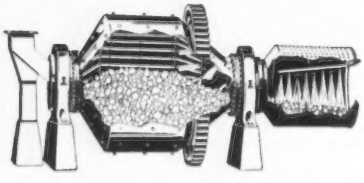
THICKENERS—CLARIFIERS



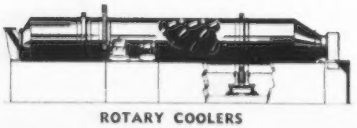
AUTOMATIC BACKWASH SAND FILTERS



COUNTER-CURRENT CLASSIFIERS HEAVY-MEDIA SEPARATORS



CONICAL SCRUBBERS



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Arizona *(Continued)*

tion now under construction. The line is to be completed by late September. Until it is completed, the mining company is supplying its own power for preliminary operations.

★**Fringe benefits** for Arizona copper miners average $715.28 a year over and above regular and overtime wages.

Reporting on a survey of the state's large copper mine operators, the Arizona Department of Mineral Resources pointed out that fringe benefits have become an increasingly important part of the yearly wage.

The main Arizona copper companies employ 9,200 men out of a total 10,800 engaged in Arizona copper mining. Survey information covered the years 1951 and 1952. Some of the fringe benefits are required by state and federal laws. Others are part of the union contracts.

The state survey showed that total annual wages paid during 1951 and 1952 to 14,200 mining, quarrying, and smelting employees was $63,482,042.

Had all received the same benefits as the copper mining company employees, $10,156,976 would be added to the cost of operating.

Fringe benefits not shown on the employees' checks amounted to 15.67% of the regular payroll. The copper workers received a base of $1.83 per hour. Fringe benefits added another 28¢ an hour. Average annual wage, exclusive of fringe benefits, was $4,566.

★**A thousand** mortage applications valued at $9.5-million have been filed for construction of homes for San Manuel, Ariz., copper miners.

The applications were presented to the Phoenix FHA office by the Del E. Webb Construction Co., of Phoenix, Ariz., and Aldon Const. Co., and Louis Lesser Enterprises Ltd., of Beverly Hills, Calif., who hold the contract to build the complete new town for San Manuel Copper Corp., a subsidiary of Magma Copper Corp.

It was reportedly the largest single mortgage filing in Arizona. More than 30,000 forms were rushed to completion by Webb employees to beat a June 30 deadline in order to come under Federal National Mortgage Assn. jurisdiction. Filing fees for the mortgage applications totaled $44,325.

★**Sale of control** of the Banner Mining Co., Tucson, by Grimes Estate of Tucson to Tintic Standard Mining Co., Salt Lake City, has been announced. Banner recently signed a government contract for production and sale of 12,960,000 lbs. of copper at 31¢ a lb. from its Pima County, Ariz., mines southwest of Tucson.

★**New Jersey Zinc Co.** is planning an extensive exploration project in the Jerome copper mining district. The exploration is to be made on mining claims owned or controlled by Verde Exploration Ltd.

Under terms of the New Jersey-Verde Exploration contract, New Jer-

sey reportedly will spend $50,000 in 1953 for exploration drilling, will advance $10,000 for options and leases and will finance Verde's operation expenses up to $16,000 annually.

New Jersey reportedly may withdraw any time after spending the $50,000. In the circumstance that a commercial ore body is discovered, a new company, 51% owned by New Jersey, is to be formed and up to $1-million supplied by it for development. Verde is to hold 49% of the stock.

★**A contract** for 5.5-million lb. of copper from a deposit known as the Old Reliable Mine in the Bunker Hill district, has been signed by DMPA and Copper Creek Consolidated Mining Co., of Tucson.

DMPA will advance no money, but will purchase all refined copper produced under the contract up to 5.5-million pounds at 29¢ per pound, f.o.b. common carrier's conveyance, Midwest points.

The company will prepare the ore body for leaching and construct a copper precipitating plant at a total cost of about $150,000. The contract expires June 30, 1956.

Leaching has seldom been used on underground deposits. There already are two tunnels in the orebody and some copper has been produced by underground leaching, DMPA officials said. Studies by the Bureau of Mines indicate that underground leaching can be employed on a commercial scale.

★**Anticipating** the day when atomic energy will be made available for civilian use, Atomic Utilities of Arizona has applied to the Arizona Corporation Commission for a statewide certificate to construct and operate service equipment and facilities for producing and distributing atomic-generated energy. It is the first such filing in Arizona.

Atomic Utilities is a partnership comprised of Lee Ackerman, advertising and development executive, Phoenix; Milton W. Bochat, Phoenix builder; Hubert Merryweather, Santa Cruz County, president of the Arizona senate; and Alfred Hanson, Phoenix Insurance Company executive.

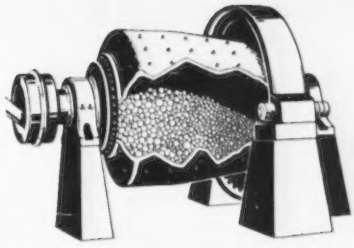
Ackerman said the company is exploring possibilities of obtaining a franchise to build and install an atomic pilot plant that has been developed by North American Aviation Corp.

At present the corporation is financed to conduct advanced research. Additional financing would be required to undertake an atomic energy plant. Cost of the North American-designed plant is around $10-million.

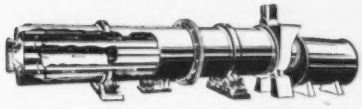
CALIFORNIA

★**An extensive deposit** of rock perlite has been discovered in the Pinnacles National Monument, San Benito County, according to the Mineral Information Service of the California Divi-

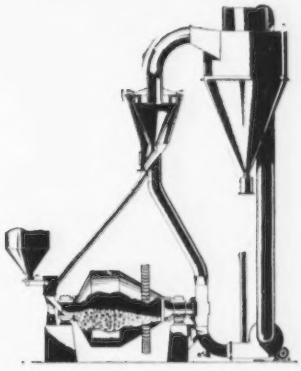
Hardinge Milling Equipment



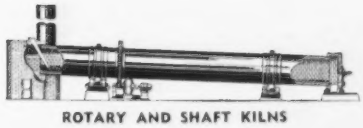
TRICONE MILLS



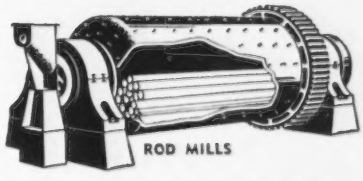
DOUBLE-SHELL ROTARY DRYERS



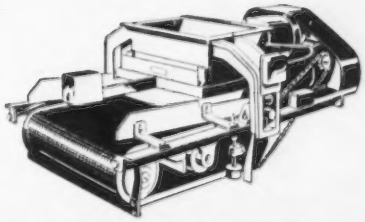
AIR CLASSIFYING SYSTEMS



ROTARY AND SHAFT KILNS



ROD MILLS



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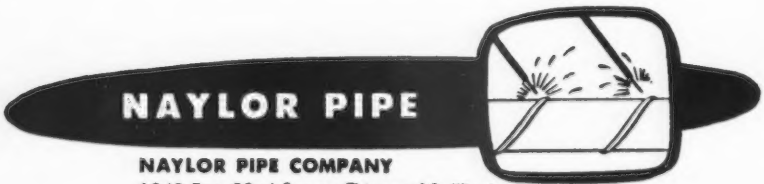

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California *(Continued)*

sion of Mines. The announcement aroused hopes that the deposit extends beyond the boundary, for minerals may not be mined within the monument. Geologists of the California Division of Mines made the perlite discovery.

★**The state's** total 1952 output of gold, silver, copper, lead and zinc was worth $17,151,792—a 21% drop from the 1951 level, the U. S. Bureau of Mines annual report reveals. Gold accounted for 53% of the total value; lead, 21%; zinc, 18%; silver, 6%, and copper, 2%. The gold production dipped 24% below the 1951 figure, and the Bureau offered two contributing factors: unchanged gold price and depletion of workable gold bearing material at some properties.

Other 1952 production figures compared to those of the previous year are lead, down 20%; zinc, 2% lower; silver, a 4% drop; and copper, down 13%. The decline in lead prices put many mines in the small-producer category out of operation, the Bureau reported. Important factor in the slash of production figures was the curtailed production after midyear at Anaconda Copper Mining Co.'s Shoshone group (lead) and closing of Coronado Copper & Zinc Co.'s Afterthought mine (zinc).

COLORADO

★**The Department of Interior's** unit award for meritorious service was presented (July 1) to employees of the Bureau of Mines' oil-shale mining and demonstration branches in a ceremony at the Rifle, Colo., test plant.

Employees of the plant were credited by the department's citation with having made "outstanding progress in laying the foundation for a new American industry, based on production of liquid fuels from oil shale."

The citation said "the oil-shale mining branch has developed and demonstrated a highly mechanized method of mining oil shale at very low cost. By tailoring equipment and techniques to the job at hand, volume production has been achieved at unit costs far lower and man-day outputs far higher than most optimistic forecasts.

"The oil-shale demonstration branch has designed, constructed and operated units for retorting oil shale and refining shale oil that are adapted to American conditions and can be expanded for commercial production. This work has culminated in the construction and operation of a new demonstration-scale retort, developed through careful observation and technical imagination, and in plans for a catalytic treating unit to improve shale-oil products.

"Liquid fuels now can be produced from oil shale at costs near the level of those for similar products from petroleum."

IDAHO

★**Polaris Mining Co.** has been granted federal funds up to $348,000 on its proposed deep-level easterly exploration into adjoining properties of Merger Mines, American Silver, Silver Standard, Coeur d'Alene Mines Corp. and Rainbow Mining and Milling Companies from the 3,000-ft. level of its Silver Summit shaft.

Proposed operating agreements to cover the project have been approved by the stockholders of Polaris, Coeur d'Alene Mines, American Silver and Silver Standard. Negotiation of contracts with Merger and Rainbow are still in progress. Also involved are Callahan Consolidated Mines Inc., and Coeur d'Alene Consolidated Silver-Lead Inc., by virtue of earlier development agreements which they had with the other firms.

Coeur d'Alene Mines, which has been developing the area from the 2800 level of its shaft, suspended operations late in June and has placed the property in condition for easy maintenance when Polaris takes over.

Principal feature of the exploration will be an easterly lateral nearly two miles long through the adjoining properties and other lateral exploration therefrom as conditions warrant. The new tunnel will be connected with Coeur d'Alene Mines' 2800 level through a 330-ft. raise at a point about 2800 feet east of the Summit shaft.

Profits from any ore developed through the exploration will be divided in accordance with profit-sharing percentages set forth in the operating agreements.

★**Sunshine Mining Co.'s** electrolytic antimony plant, built early in World War II and "decommissioned" in January, 1944, is again in full operation after several months of preparations to reactivate. Production is being stockpiled for the time being.

★**Mine production** in the Coeur d'Alene area totaled 1,933,109 tons of ore during 1952, a rate nearly as high as that of 1951 when 1,960,892 tons were mined, according to reports filed with the county assessor of Shoshone County, in which the district is located. Value of output, however, was 12% lower in 1952—$52,324,121 as compared with the all-time high of $59,663,980 in 1951. Thirty mines and seven leases reported production last year. The Bunker Hill mine of Bunker Hill & Sullivan Mining and Concentrating Co., the Star mine of Sullivan Mining Co. and the Page mine of American Smelting and Refining Co. were the leading producers, in that order, both in tonnage extracted and in gross value of production.

★**Deepening** of the big main shaft at Day Mines' Hercules property is progressing on schedule and was expected to reach its objective depth of 1,685 feet early in August. A 1600-level station will then be cut and

EXCLUSIVE NEW NON-CLOG TRAVELING BREAKER PLATE

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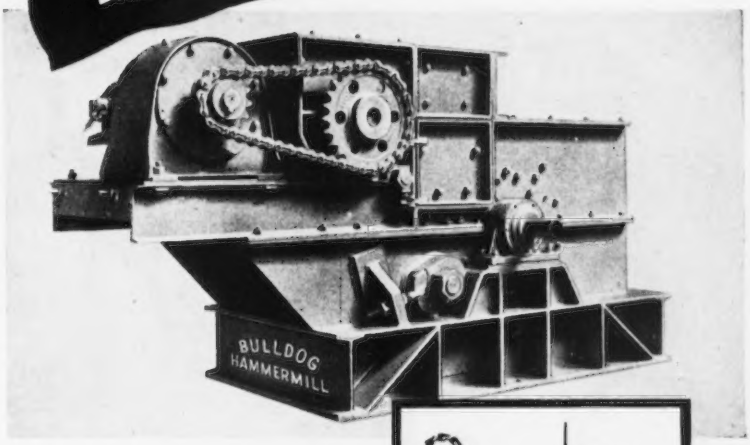

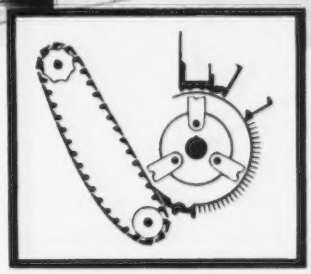

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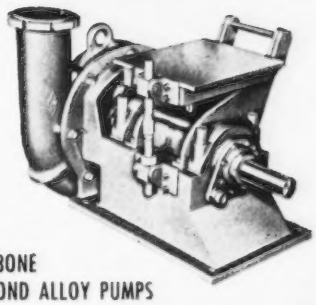

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Heil 15-yd. H-60 Rock Body with 70° double-acting hoist in operation on the Mesabi. Heater arrangement in floor utilizes heat of exhaust to prevent ore freezing to body.

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HEILINER 20-CU. YD. BOTTOM DUMP WAGON

CABLE POWER CONTROL UNITS

Idaho *(Continued)*

extensive exploration undertaken on the new lower horizon. The project is being carried on under a $242,860 Defense Minerals Exploration Administration project.

★**Quebec Metallurgical Industries Ltd.**, subsidiary Ventures, Ltd., is reported to be heavily interested in cobalt exploration and development in the Blackbird district of Lemhi County. Under development is the Stevenson property which adjoins Calera Mining Co.'s cobalt-copper operation on the east. Plans call for treatment of concentrates from the property at the new smelting plant of Cobalt Chemicals Ltd., near Cobalt, Ontario. Nevada interests are developing another cobalt prospect west of the Blackbird mine.

★**Bunker Hill & Sullivan Mining and Concentrating Co.** has commenced deepening the three-compartment shaft at its Crescent property on Big Creek across from the Sunshine mine. Three crews are pushing the work on an around-the-clock basis, six days a week. The shaft is to be deepened from the 1200 to the 3200 level under a defense minerals exploration contract totaling over $1-million. Costs are shared equally by Bunker Hill and the DMEA. Included in the project will be extensive lateral exploration and diamond drilling on the 3200 level.

★**Deep-level exploration** from the 3000-ft. level of the Silver Summit shaft has penetrated Chester Mining Co. ground and will be continued across the entire 1500-foot width of the property. The work is being done by Polaris Mining Co. under a profit-sharing agreement.

★**Atomic Energy Commission** has installed supersensitive radioactivity assaying machines in the assay offices of Day Mines Inc., and Coeur d'Alene Mines Corporation in the Coeur d'Alene mining district. About 25 of the new devices, capable of detecting and measuring uranium oxide content of less than 0.05%, are being scattered throughout the country at assay offices and smelters to provide the Atomic Energy Commission with a nation-wide routine check on ore samples brought in for assay.

★**Idaho Consolidated Mines Inc.** planned to have its Twin Peaks mine south of Salmon, Idaho, in production by August. Construction of a 150-ton mill is about 50% completed and stope preparation is well-advanced, three stoping areas being ready for production and four others in preparation. Concentrate production will be shipped by truck to smelters at Salt Lake City and Butte.

★**Two hundred** acres of Caribou County land were offered for phosphate lease at a sale held June 29 by the Bureau of Land Management. The lands are located some 15 mi. northeast of Soda Springs.

MAINE

★**To assist** in the development of a process for treating low-grade Aroostock County, Maine, manganese ore, the DMPA has entered into a contract with E. S. Nossen Laboratories, of Paterson, N. J., to install a half-million dollar pilot plant. Capacity of the plant is to be two tons of metallurgical ore a day with the Nossen nitric acid cycle process, which has proved successful on a laboratory scale.

MICHIGAN

★**Final delivery** on its order for 400 70-ton ore cars has been made to Chicago & North Western Railway by Bethlehem Steel Co. The North Western now has a total of 4404 ore cars serving the Michigan ranges.

★**Reserves of crude low-grade ore** in Iron County, Michigan, are estimated by the State Geologist to be around 525-million tons. The Marquette range tonnage is estimated at 865-million tons; Gogebic range, 300-million tons and Dickinson County, 120-million tons —a total of 1,810-million tons.

MINNESOTA

★**The Albany mine,** operated by Pickands Mather & Co., is mining the last of its open-pit ore and is preparing to revert to its original status (which started in 1903) as an underground property. Development drifts are being driven in the northeast wall of the pit. Underground ore will be brought out to the pit and raised to surface by conveyor. Construction of loading facilities from pit to surface is in progress. Mine buildings will be in the pit. Ore will be mined from the pit until the underground is ready for production. Up to 1953 the Albany shipped 13,729,677 tons.

★The 690-ft., 19,500-ton ore carrier "**Ernest T. Weir**" is the latest addition to M. A. Hanna's lake fleet. It is estimated that it will carry 873,000 tons this season. The "**Joseph H. Thompson,**" added to the fleet last year, is 714 ft. 1¼ in. long and has 18,700 tons' capacity.

★**After operating nearly 40 years,** the Bennett underground mine finished its work this spring. Pickands Mather & Co., the operators, took it over in 1917. Mining will continue from the three open pits. Up to 1953 the property had shipped 20,639,802 tons.

★**The seven companies** shipping the largest tonnage in 1952 were the same as in 1951 and in the same order: U. S. Steel's Oliver Iron Mining Division; Pickands Mather & Co.; M. A. Hanna Co.; Cleveland-Cliffs Iron Co.; Jones & Laughlin Steel Corp.; Republic Steel; and Inland Steel. Oglebay, Norton & Co. supplanted Steep Rock Iron

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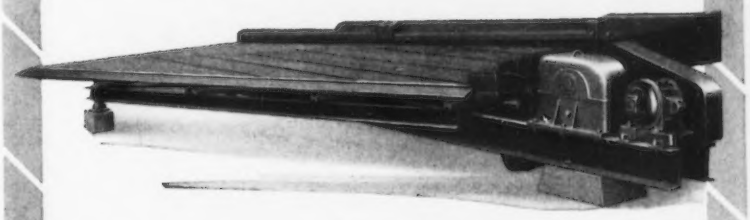

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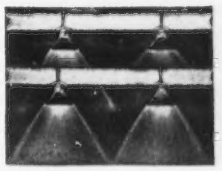

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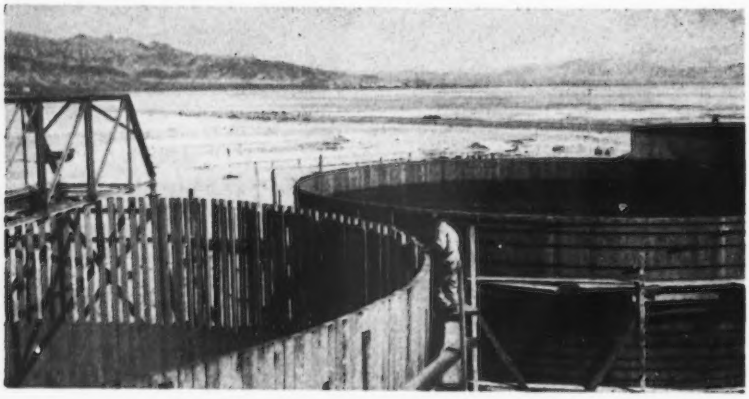
INDUSTRY NEWS IN BRIEF . . .

SANTA FE TANK & TOWER COMPANY SHOWS FLEXIBILITY OF WOOD TANKS FOR MINING OPERATIONS



Wood storage tanks have long served as standard equipment for the mining industry. And with the rapid progress of mining, the ever-efficient wood tank continues to play an increasingly important role.

The Santa Fe Tank & Tower Company, Los Angeles, has devoted no less than 50 years to this field. As one of the leading authorities in wood engineering, Santa Fe has succeeded in developing wood tanks to their *maximum* potential. They have multiplied the uses for wood tanks in mining operations by offering *flexibility* in sizes, shapes and field erection. Actually, the capacities of wood tanks are almost limitless . . . measuring, for example, from 50 gallons to almost 2 million gallons in capacity. These tanks are built in many shapes, according to customer requirements. The diameters likewise vary from 2 feet to as much as 120 feet, or even more. Santa Fe engineers emphasize that "there is almost no limit to what can be done with wood tank construction." They have also been found to be easily *dismantled*, and then *re-erected* in other localities.

Wood tanks are now universally accepted for almost all mining operations . . . gold, silver, copper, uranium, to mention a few. For the storage of water, acid solution, leaching plants and other mining operations, wood tanks are desirable for their resistance to corrosion. Serving almost any storage purpose, they have the ability to withstand constant use for many years. Maintenance costs are generally very low, particularly since painting is not required.

The installations shown here were designed and fabricated by the Santa Fe Tank and Tower Company. Additional information (Mining Bulletin M-45) is available by writing Santa Fe, 5401 S. Boyle Ave., Los Angeles 58, California. Engineering data is also available on Wood Pipe, Cooling Towers, Cylindrical Gas Scrubbers, and other industrial wood specialties. Santa Fe maintains branch offices in all principal cities.

Minnesota *(Continued)*

Mines for eighth place, Steep Rock being ninth in 1952.

★**Inland Steel Co.** expects to begin development work on its property at Steep Rock Lake this year. Drilling has shown about 50-million tons of ore.

★D. D. Haley (Hibbing), Oscar Nelson (Virginia), Joseph Lovallo (Mountain Iron), and John Langhausen, B. C. Timmerman and Helmer A. Frankson (also of Hibbing) recently organized the **Sylvia-Dee Mining Co.** and will operate the Michael mine near Buhl. A 2-cu. yd. shovel and several 22-ton trucks have been purchased. A crushing and screening plant will be built this season.

★**Lerch Brothers, Inc.**, Hibbing, Minn., has been allotted all ore analysis work for the Iron Ore Co. of Canada in Quebec and Labrador.

★**The new concentrator** at Jones & Laughlin's Hill-Annex mine at Calumet, Minn., after the usual period of adjustments, is now working at capacity. In addition to straight washing equipment, it contains high-density, cyclone and spiral units for the ores more difficult to beneficiate, that will form a large proportion of the future crude supply.

★**The Wacootah mine** at Mountain Iron, formerly worked by Pitt Iron Mining Co. and Wheeling Steel Corp., is being operated by Pacific Isle Mining Co. The ore is shipped by rail to the Coons-Pacific washing plant at Eveleth for treatment. Pacific Isle produced 32,347 tons from the mine in 1952. Shipments from its opening in 1906 to 1953 total 7,642,582 tons.

★**Work is in progress** on a large addition to Euclid Road Machinery Co.'s building in the Hibbing district on Highway No. 169. This will provide space for completely rebuilding truck units.

★**A crushing and screening plant** which is being built at the Boeing mine, Hibbing, by Rhude & Fryberger, who are stripping the former underground property, is scheduled for early completion. The Boeing is expected to ship this season. It contains an estimated 1,324,597 tons of ore. Cleveland-Cliffs will handle the ore.

★**The new pit**, which serves Oliver Iron's new Pilotac plant, near Mountain Iron, is three-quarters of a mile wide. About 2-million cu. yd. of stripping has been removed. A 190-B Bucyrus-Erie shovel loads the crude taconite into 40-cu. yd. dump cars. Crushing is done in three stages: a 48x60-in. jaw crusher reduces it to 4½-in. pieces; a gyratory takes it to 2½ in., and a third breaks to ¾-in. Ball and rod mills complete the reduction to 300 mesh, at which size it is ready for the magnetic separator. The concentrate runs 60% iron or better, the crude taconite containing about 30% iron. The plant is expected to be in full production by late summer at its

rated capacity of 500,000 tons of concentrates per year.

★**Cleveland-Cliffs Iron Co.** recently announced an increase in iron ore prices effective July 1. The new base prices for 51.50% natural iron, delivered at Lake Erie ports, are: Mesabi range non-bessemer, $9.90; Mesabi range bessemer, $10.05; Old Range non-bessemer, $10.15; Old Range bessemer, $10.30; open-hearth lump, $11.15.

★**Reserve Mining Co.**, beginning this fall, will offer two $500 scholarships each year for the next five years. For outstanding engineering and science students interested in taconite concentration, the plan will pay $500 for each of their academic years. Students who have completed two years of engineering or pre-engineering courses at the University of Minnesota at the Duluth branch or the junior colleges at Virginia, Eveleth, Ely, Hibbing or Grand Rapids, and who are eligible to continue advanced study at the University of Minnesota, may be candidates for the awards.

MONTANA

★**Amador Mining Co.**, a Missoula firm, has concluded an agreement with Kootenay Copper Mines Inc., also of Missoula, for purchase of the latter's long-term lease on the Green Mountain mine near Dixon, Mont. A purchase price of $100,000 has been set for the lease, including machinery and equipment, payable in the form of royalties and a share of the gross profits from the operation. The Green Mountain property has produced about $250,000 in high-grade copper, with by-product values in silver, gold and platinum, from shallow workings down to a 200 level. Amador Mining plans to deepen the shaft another 100 ft. or more and open the vein for 500 ft. on the lower level as the first phase of its operation.

★**Newly - incorporated** Philipsburg Tungsten Co. is planning to construct a mill to concentrate copper, silver and tungsten ores from the old Combination mine in the Black Pine district northwest of Philipsburg. The mine has a production record from gold and silver values, mostly before 1900, but the tungsten values were not detected until during World War II.

★**Finlen & Sheridan Mining Co.** of Butte has started a new barite mining industry in Montana, mining and milling high-grade deposits near Greenough in Missoula County. Mining operations were started a little over two years ago and the crushing plant was put into operation in June, 1952. Current production is running about 12 to 14 cars of pulverized barite and 4 to 6 cars of crushed barite per week.

★**Annual meeting** of stockholders of Anaconda Aluminum Co. was held in Butte May 19, and the entire 500,000 shares outstanding was represented in

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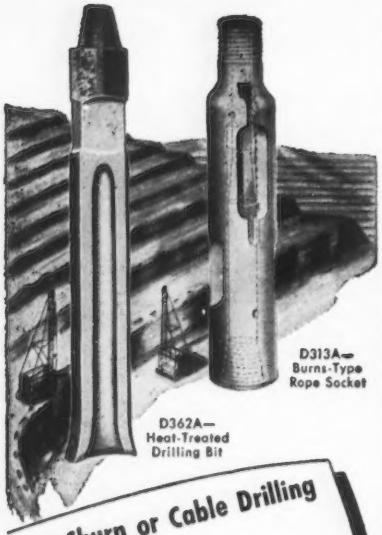

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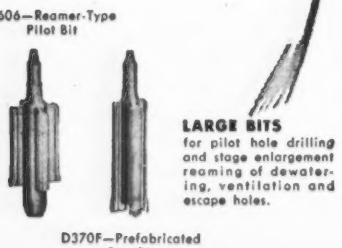

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Montana *(Continued)*

person and by proxy. Directors elected for the ensuing year were Cornelius F. Kelley, Robert E. Dwyer, Clyde E. Weed, Edward S. McGlone, Roy H. Glover, Frederick Laist and Russel B. Caples, all high company officials.

At the annual meeting of stockholders of the Anaconda Copper Mining Co. May 20, R. H. Glover, E. S. McGlone and Maurice Newton were re-elected directors to serve for three years. Glover is vice president and general counsel and McGlone is executive vice president of the company. Newton is a New York investment banker. Glover presided at the meeting as chairman and C. E. Moran, New York, secretary of the company, served as secretary. Represented in person or by proxy were 6,230,487 shares of stock, about 72% of the stock outstanding.

★**Pony Tungsten Enterprise,** on May 7, 1953, was incorporated in Montana by Fred D. Box, Pony; Emmett J. Clary, Sr. & Jr., Pony; Andrew L. Mular, Butte, and John Rytlewski, New York City, with capital of $500,000. Clary, Jr., Mular and Rytlewski are students at the Montana School of Mines, who were instrumental in locating 29 new claims, on which they discovered tungsten ore and other minerals while on a visit to Pony last winter. Extensive tests have been run on the ore at the School of Mines since that time. Clary, Sr. and Box are experienced mining men who have been operating the Strawberry mine in Pony for a number of years. It is expected that the new corporation will become active in the near future.

★**Neuberg Brothers & Sloan Inc.,** Box 124, Basin, Jefferson County, has been granted a loan by the DMEA for $22,700 to explore the Eva May property for lead, zinc, copper, gold-silver. The company controls seven patented and seven unpatented mining claims in the Cataract mining district, eight miles north of Basin, on which several thousand feet of work has been done, including a 1200-ft. shaft.

★**Sunshine Mining Co.,** Kellogg, Idaho, has contracted with the Mines Prospecting & Exploration Co. of Missoula, together with other owners of claims, to do a limited amount of exploratory work on mining claims having tungsten (scheelite) showings in the Storm Lake district west of Anaconda and south of Silver Lake, Deer Lodge County. Sunshine has applied to the DMEA for a 75% tungsten exploration loan and plans now are being made to start the work within a short time. The Storm Lake property was developed in a small way as a silver prospect years ago.

★**A promising deposit** of phosphate rock has been located in the Centennial Range, along the Montana-Idaho state line. This was reported in Washington by the Geological Survey which is investigating Western phosphate deposits in co-operation with the

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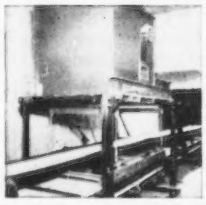

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One Sure Way to Get MORE DEFENSE FOR LESS MONEY

How can we get more national defense for less money? The best answer yet given to this question appears in a little-noticed section of the new defense budget. That answer, with which this editorial is concerned, is to provide more equipment with which to step up munitions production in an emergency. Thus we can eliminate much of the need to stockpile finished munitions in advance.

The new defense budget provides an appropriation of $500 million, to be invested by the Secretary of Defense in specialized facilities required to produce munitions on a wartime scale, but not adapted to profitable operation by private industry in normal times. Facilities of this type are known as "stand-by capacity."

There is no strictly political controversy over the "stand-by capacity" program. It was originally suggested by Clay Bedford, Special Assistant to the Secretary of Defense during the Truman administration. It has since been reviewed and endorsed by the Eisenhower administration. Moreover, it involves little or no technical controversy. Civilian and military experts are well agreed that the only alternative to enormous expenditures for stockpiling military equipment is to provide enough facilities for producing it quickly in an emergency.

Here is the Key Idea

In his speech of May 19, introducing his defense budget to Congress and the nation, President Eisenhower stressed the value of such reserve capacity in these terms, ***"The more swiftly and smoothly we can mobilize, the less our dependence upon costly standing armies and navies."***

In accord with this idea, the $500 million requested for the present reserve capacity program would be invested in tools that require a long time to produce, and so present grave complications in an emergency unless they are ready in advance. Some such tools would be installed in new plants that are needed to eliminate potential bottlenecks in the defense production program. Others would be ordered to replace that part of the government's present machine-tool inventory which is made obsolete by changes in the design of defense products. By completely "tooling up" with the most modern equipment, the admin-

istration hopes to realize a production potential many times greater than could be achieved by spending the same amount of money on military end-products.

Examples of Savings

In the specialized field of defense production, adequate modern capacity is the key to both economy and speedy delivery in a pinch. Here are some striking examples from the recent report of the Advisory Committee on Production Equipment (Vance Committee) to the Director of Defense Mobilization:*

—In the case of certain ammunition components, the cost of new capacity can be recovered in only six weeks of full production.

—If $500 million worth of special tools needed to make aircraft are purchased in advance, aircraft production during the first two years of war will be increased about $18 billion. In other words, it costs 1/36 as much to acquire the tools in advance as to acquire the aircraft.

—In the case of a certain ordnance item, an expenditure equal to the cost of only 150 units of the item will provide the capacity to produce thousands and save three years' time in meeting mobilization requirements.

Moreover, reserve plants and equipment can be kept up-to-date at only a small fraction of the cost required to maintain an up-to-date reserve of military end-products. The cost of replacing 5,000 obsolete tanks is at least $1 billion. The cost of new tools for a tank plant would be less than 10% of that amount.

*This Committee, headed by Mr. Harold Vance, President of the Studebaker Corporation, included Clay Bedford, then President of Chase Aircraft, Manly Fleischman, former Defense Production Administrator, and several retired military leaders with wide experience in procurement.

Savings Will Multiply

On the basis of facts like these, the Vance Committee recommended that the Defense Department spend $500 million to $800 million per year on specialized defense production facilities in order to provide substantial reserve capacity as soon as possible. It also recommended that expenditures for military end-products which get obsolete rapidly be held to a minimum. The Eisenhower administration has adopted this approach to the problem of munitions production in asking that $500 million be invested in reserve capacity.

The importance of this approach is much greater than is indicated by the amount of money to be spent on new tools, although this amount will go far toward assuring a healthy machine tool industry, adequate to meet emergency demands. ***What is really important is the great saving that can eventually be made in the cost of our defense program by a modern tooling program.*** If we are to maintain this program for a long period, and if we are to pay as we go, we must have a low-cost program. No other plan to reduce and control the cost of a garrison economy can compare with the new approach suggested in the Vance Report and now embodied in the new defense budget.

Congressmen will do well to scrutinize all military appropriations carefully. They have a chronic tendency to be too big. But there should be no penny-pinching on investments in capital equipment that will pay out in as short a time as six weeks in a war emergency. It would be tragic if this opportunity for real economy were lost in the controversy over other aspects of the defense program. ***The tooling program is a key part of the Eisenhower effort to cut defense costs. It should be promptly approved.***

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Atomic Energy Commission and Reclamation Bureau of Montana, Wyoming, Idaho, Utah and Nevada. Geologic Survey said that phosphate deposits were first reported in the Centennial Range area in 1928 "but their potentialities were not recognized until recent sampling and mapping showed the presence of large reserves . . . averaging four to six feet in thickness and containing about 31% phosphate—perhaps 50-million tons or more."

NEVADA

★**Value of the 1952 output** of the state's mines fell below the 1951 level for four metals, according to a U. S. Bureau of Mines report, but an "unwavering demand for copper" enabled the 1952 yield to top the previous year's copper output by 2%.

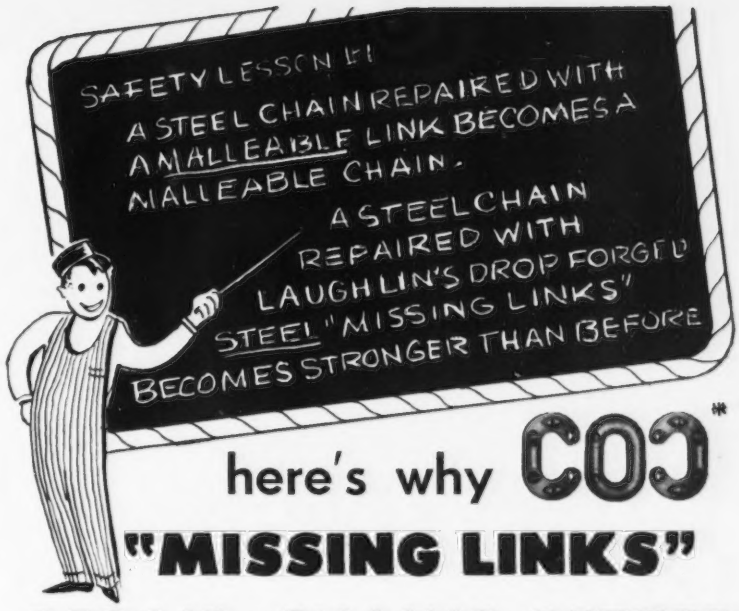
The five metals accounted for a total value in 1952 of $40,086,746—2% below the 1951 level. Of the total value, copper accounted for 70%. The remainder consisted of zinc, 13%; gold, 10%; lead, 5%, and silver, 2%.

Production figures comparing 1952 yields with those of 1951 show lead down 5%, zinc 12% lower, gold decreased 3%, and silver down 4%. The silver output was lower than it has been for 53 years.

★**Extensive preparations** are nearing completion for a widespread development program at the Mohawk mine near Silver Peak, according to R. M. Hardy Jr., who is in charge. The Sunshine Mining Co., which has taken an option on the property, has moved considerable major equipment onto the site, and a hoist house, change room and three dwellings for employees have been constructed from pre-cut housing materials. The old hoist has been replaced with a 75 hp. diesel electric unit. A 500-cu. ft. compressor and an air trammer also have been installed.

★**Placer mining operations** on 1,200 acres of land along the eastern slope of the Pine Forest range in Humboldt County are being carried out by Lewis C. Mehan, of Redwood City, Calif. Recovery of gold is the primary objective. Four men are employed on the operation with a bulldozer, carryall, dragline and other equipment, and are moving about 100 yd. of material per hour. Mehan is associated in the project with W. W. Whitaker, of Fallon. They are leasing the mining property from the Eureka Harburg Mining Co.

★**Antimony** is being produced in substantial amounts from the Last Chance Mine near Manhattan following several months of idleness due to bad weather. Twelve men are employed on the property, and the payroll is expected to reach 22 in the near future. Milling of the ore is being done at a plant in the Big Creek region between Austin and Tonopah.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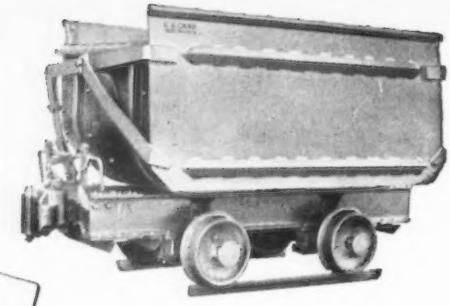

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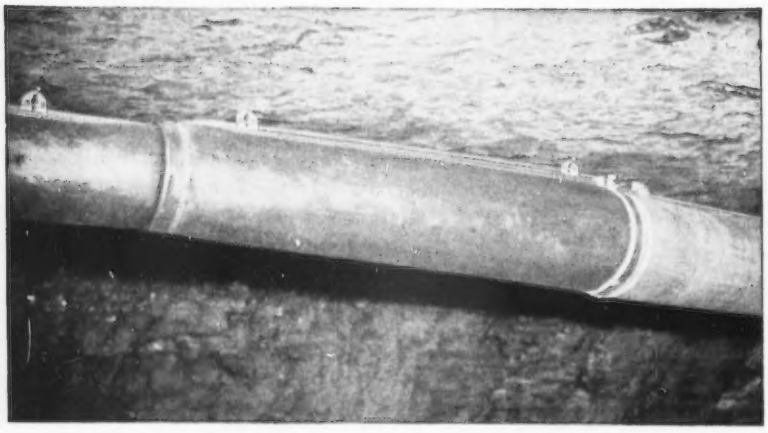

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Nevada *(Continued)*

★**About 600 tons** of scheelite is being milled daily near Hiko in the Tempiute district by Lincoln Mines division of the Black Rock Mining Corp. Important amounts of zinc as a by-product are being recovered also. Formerly the plant treated 750 tons of gold ore daily from the Northumberland mine northeast of Tonopah.

★**Fire temporarily halted** operations at the Eagle-Picher diatomaceous earth treatment plant east of Reno June 26. The blaze destroyed the secondary crushing plant and burned up machinery and several motors before it was controlled. Milton Steinheimer, superintendent, utilized most of the 50 men on the payroll to repair the damage. The secondary plant was bypassed. Rebuilding of the burned section began immediately after the fire.

★**Production is expected** to start in October at Anaconda Copper Co.'s new development at Weed Heights near Yerington. An ore beneficiation plant and a sulphuric acid plant have been completed and an all-weather road has been constructed to the Leviathan mine near Markleville. It will supply sulphur for the Weed Heights plant. Overburden is being stripped from the estimated 35,000,000 tons of oxide ore at a rate of 1-million tons per month. Eventual cost of developing the project is estimated by Anaconda officials at $32,750,000. When operations get underway, the property will be one of Nevada's largest copper producers.

★**Pioche Manganese Co.** went into production of ferromanganese at Henderson, June 22, culminating nearly two years of construction and conversion of old BMI facilities. The company is using a 7,500 kva electric furnace, and expects to have a second furnace in operation this summer.

Furnace feed for Pioche is produced at a kiln located at Caselton, Nev. from ores mined by an associated company, Combined Metals Reduction Co.

When both furnaces are in operation, Pioche expects to employ a crew of some 60 men.

★**Stripping operations** are in progress at a newly discovered iron mine in Brunswick Canyon east of Carson City. The Continental Nevada Iron Mining Co. is carrying out the work with three bulldozers. Bill Van Der Lay, of Carson City, superintendent of the project, says the mine has a potential of nearly 1-million tons of high grade iron ore. William Fischer, geologist in charge, calls it the best iron ore he has found in his 37 years of mining. The claims are being leased from Jack Ross, Carson City attorney. Fischer said he can not tell at this time where the ore will be shipped.

★**An exploration tunnel** has been completed for a distance of 340 ft. in the Garnett Tungsten mine in Elko county. E. O. Hart is company manager

in charge of the work, and the Gallagher Co. of Salt Lake City, which made the test runs on the ore, will supervise construction of a mill on the property. Plans for the mill call for a capacity of 150 tons daily. The Garnett Tungsten Co. expects to do part of the mining by open pit method. L. D. Wilson, of John Day, Ore., is president of the company, Ray E. Summers, of John Day, is vice president, and Harold A. Culp, of Mountain City, is secretary and treasurer.

★**Plans for reconstruction** of the Manganese Inc., mill at the Three Kids Mine near Henderson which was partially destroyed by fire June 16 were being made as officials of the company and fire department investigators were probing the rubble in an effort to determine the cause of the blaze.

The fire, which broke out in the rod mill near the bins, did damage estimated at several hundred thousand dollars. It spread rapidly through the rod mill to the flotation plant.

NORTH CAROLINA

★**Plans for a mineral museum** on the Blue Ridge Parkway near Spruce Pine moved a step nearer reality as Gov. William B. Umstead and the North Carolina Council of State on June 26 authorized allocation of $75,000 for construction.

The mountain minerals industry has agreed to contribute free sand, crushed rock and building stone and to do the grading. Exhibits with an estimated value of $15,000 are to be furnished free.

National Park Service reportedly plans to build walks and roadways, donate the site and install all utilities. Park personnel also would erect and operate the building, which is to be designed by National Park Service architects.

NEW MEXICO

★**Arthur Montgomery,** owner of the Harding beryl mine near Dixon, hopes "to do better this year." In 1950, with nearly 200 tons, the Harding mine was the nation's largest individual producer and accounted for some 40% of that year's beryl production. In 1951, however, production fell to about 28% of the nation's total; 1952 output fell to about 16%.

"We have only five men working, with Flaudio Griego, my partner, in charge of all mining," Montgomery said. "We use a mule instead of an air hoist, have the smallest style of portable compressor and only one small jackhammer.

"This year," Montgomery continued, "I think we will climb back to 25% and I predict that we may stay at that point for 1954. No expansion, one mule and four miners are enough, but we are simply finding more beryl," he said.

★**State Revenue Commissioner Manuel Lujan** heads a new corporation, the Petaca Mining Corp., formed here to operate mica properties at Petaca, Rio Arriba County, some of which have been mined for 300 years.

The new firm, a Delaware corporation, will take over the properties from the Petaca Minerals Corp., a New Mexico corporation.

Lujan is president and treasurer of the new firm. Other officers are Col. E. Grove Cullum, Santa Fe, vice president; Lyle Teutsch, Jr., Santa Fe, secretary; and James K. Boyd, Longmont, Colo., and Joe Thompson, Rio Arriba County, directors.

Southwestern Engineering Co., Los Angeles, is designing a $250,000 mill for the operation with a capacity of 100 tons of ore per day. The mill is being designed to recover small quantities of columbite, tantalite, menazite, samarskite, beryl and germanium in the ore. Mica will be the principal product. Claims are all on federal land. It will be a surface mining operation with a crew of 40.

★**Sealed bids** for performing 60,000 ft. of non-core drilling within the Haystack-Butte area of McKinley County, New Mexico, were opened July 16 by the Atomic Energy Commission, Grand Junction, Colo. Contract winner had not been announced at press time.

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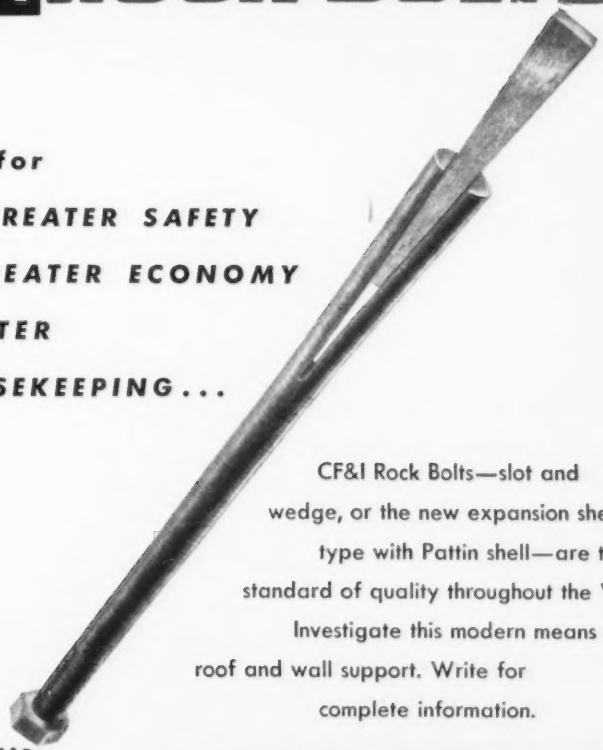

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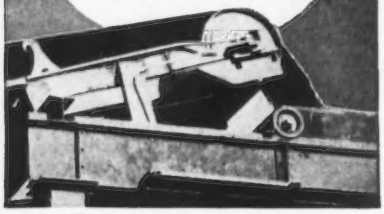

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OREGON

★**Development of diatomite deposits** in southeast Oregon's Malheur County is underway by a new company which has leased 2,700 acres and filed claims on 1,280 in the Harper-Westfall districts.

Don E. Galbreath, head of the firm incorporated as Malheur Wonder Earth Co., Vale, said that a crushing and screening mill has just begun operating at Harper. Initial production was estimated at 100 tons a day. A crew of 30 to 35 will be required to handle the diatomite excavation and screening. Other incorporators are R. C. Rush and Dan W. Hartley, Portland, and C. A. Craig, North Powder. Capitalization plans call for $250,000.

Deposits at Harper are easily worked, having no earth overlay, and can be moved by power shovel. The Oregon Department of Geology and Mineral Industries reports central and eastern Oregon has extensive known deposits. Those of Oregon are distinguished by formation in fresh water. The Malheur diatomite is of unusually high quality, according to Galbreath, producing a very white powder in screening.

★**Under DMEA stimulus** exploration is under way at Bonanza quicksilver mine near Sutherlin, Douglas County. A DMEA exploration loan of $50,056 has been granted the project, of which $37,542 is the government's share. Production of the quicksilver is achieved through a process using a rotary kiln.

★**Alcoa Mining Co.,** which owned extensive interests in northwestern Oregon alumina bearing clay deposits, has been dissolved and its Pacific Northwest operations transferred to a newly created mining division of the parent Aluminum Company of America. Alcoa has an office in Hillsboro, Ore., and William L. Golden, northwest field representative, will remain there. The company did extensive exploration work during the war years when imported bauxite supply was threatened and has continued its holdings and interests for experimental purposes. There has been little activity in recent years.

★**New exploration** is underway at Almeda mine on the Rogue River north of Galice, Josephine county, by the Alaska Copper Corp. Diamond drilling was begun in May on the river level underground ore workings. Alaska is controlled by Yukon Placer Mining Co., and Transcontinental Resources Ltd., Toronto.

The mine, owned by Roy Hillis, Galice, had its principal period of activity in 1908-1916. A 100-ton matting furnace erected in 1908 operated from 1911 to 1916. Ore bodies occur in a wide zone of intense silicification called the Big Yank Lode that follows the contact between porphyritic dacite and argillite (Galice slate). Two types of ore are described in

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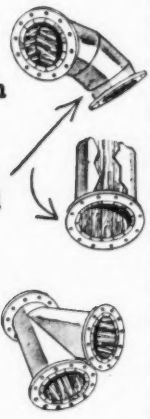

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★**The Gypsum division** of the Henry J. Kaiser Co. has closed its perlite quarrying and processing operation in Waco County. The firm dropped an option it held from Dant & Russell, Inc., Portland owners and original developers of the volcanic glass deposits. Kaiser had employed 65 men during its one year leasing operation. The Portland owners reported Kaiser's withdrawal was due to inability to find a satisfactory market. Dant & Russell opened the quarrying phase in 1945. The company has no immediate plans for resuming production.

★**Cornucopia Gold Mines,** Spokane, Wash., has renewed with the Oregon Hydroelectric Commission its rights for water to produce energy at the company's property at Cornucopia, Baker County, where mining has been shut down since the beginning of World War II. The property, largest lode mine in Oregon, is not expected to resume activity, however, unless gold price is raised or operating costs are drastically reduced.

★**Hanna Development Co.** is moving ahead at its Nickel Mountain holdings in Douglas County where the Hanna interests will mine ore for a ferronickel smelter to be built with DMEA assistance at the Riddle, Ore., site. A road is being cut to the ridge and right-of-way cleared on the mountain for tramway construction.

★**Adverse weather** has slowed the opening of some southwest Oregon chromite mining operations. Field geologists of the Oregon Department of Geology and Mineral Industries reported June 30 the activity was expected to equal—if not exceed—the record production of 1952 season under continued DMEA purchase stimulation.

Mining is concentrated in the mountains straddling the Oregon-California border and Government Service Administration maintains a purchase depot at Grants Pass, Ore., center of the workings.

Oregon geologist Ralph S. Mason reports there are more mines in operation or preparing to open than a year ago when GSA's depot purchased the bulk of the 21,216 short tons of domestic production of chrome ore concentrate and lumps. A small portion of this is shipped from central California, but the bulk is handled at the 75 to 100 mines in the southern Oregon-northern California region.

There are prospects of another good year, despite the late season start because of mountain snows and prolonged rains that blocked access to the properties.

IT'S A FACT:

AFL had the edge over CIO in bargaining elections last year. AFL won 65% and CIO only 56%. They vied with each other in 722 elections, the AFL winning 337 and CIO 298.

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TENNESSEE

★**New Jersey Zinc Co.** announces plans to start sinking a shaft later this year on its property one mile south of Jefferson City, in the mineralized area of eastern Tennessee. This property was acquired in 1947 and drilling, started the following year, has culminated in a decision to work the ore deposits. The initial shaft will be sunk approximately 1,200 ft. Plans also contemplate the construction of a mill with a 1,000 tons per day capacity. The orebody is a lead-free zinc sulphide ore, typical of the other zinc occurrences in eastern Tennessee. The area is served by the Southern Railway.

Operations will be conducted under Johnson Crawford, Tennessee superintendent for New Jersey Zinc Co.

UTAH

★**Additional Utah lands** have been segregated from the public domain for use in the Atomic Energy Commission's effort to develop sufficient uranium ores to keep production on the Colorado Plateau at a maximum and to provide uranium for the AEC program. Lands affected are the Calf Mesa area in Emery County and the Deer Flats in San Juan County. The withdrawal of the lands from entry was effective as of June 16.

★**University of Utah** researchers have reported promising gains in metallurgy leading to increases in both the recovery and output capacity of mills handling non-ferrous metals and uranium.

The developments are an outgrowth of the new Institute of Reaction Rate Process of the Department of Metallurgy of the College of Mines and Mineral Industry.

Investigations and tests conducted by Dr. Milton E. Wadsworth at Combined Metals Reduction Co. mills at Bauer, Utah, and Caselton, Nev. on flocculation of slimes and surface chemistry are said to show 100% improvement can be reached in settling and filter rates through the addition of tailor-made organic compounds.

This has the effect of increasing milling operations capacity. Greater recovery of metals values also results because a clearer supernatant liquor is attained, particularly where minerals are recovered in a leach process.

Even greater reduction of settling and filtering times was reported by Dr. Wadsworth at mills of Climax Uranium Co., Grand Junction, Colo.

★**A walkout** of 1,100 miners and smelter workers at Utah properties of the United States Smelting, Refining & Mining Co. was staved off July 1 when both sides agreed to present their case to a three-member panel of the U. S. Mediation and Conciliation Service.

CIO Steelworkers Union members involved are employed at the company's Lark, Bingham and U. S. mines, and the Midvale smelter, all lead-zinc operations. Contracts expired June 30.

The union is seeking restoration of earnings lost when USSR&M reduced its work week from 48 to 40 hours eliminating overtime in early May, an action taken in view of the lead-zinc price drop.

The company, citing the continued depressed lead-zinc price, cited its inability to pay a 48-hour wage for a five-day week but proposed to restore the work week and set adjusted wages pegged to lead-zinc prices.

★**A new agreement** between Utah Copper Division, Kennecott Copper Corp. and the International Brotherhood of Electrical Workers, Local 1438 (AFL), was announced June 29.

Seventy workers involved at the company's central power station and other electrical installations agreed to maintenance of present wage schedules until completion of a job evaluation program which the company promised to initiate at once.

★**Despite objections** from Utah-area mining men, the statistical agency of the U. S. Bureau of Mines in Salt Lake City has been transferred to

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Denver. The Salt Lake agency, little more than a remnant of the once sizable agency established 50 years ago, collected data on production of lead, silver, gold, copper and zinc for Utah and Arizona.

★**Utah lead production** of 39,400,000 lbs. in the first five months of 1953 was 43% below 1952 levels for the same period, Utah Mining Assn. statistics report. Zinc production, at 31-million lbs. was off 35%.

Chief reasons were the shutdown of Silver King Coalition and Park Utah mines at Park City, the three-month shutdown of International Smelting & Refining Co.'s reduction plant at Tooele, and the five-day work week begun in May at USSR&M mines at Lark, Bingham and near Ophir.

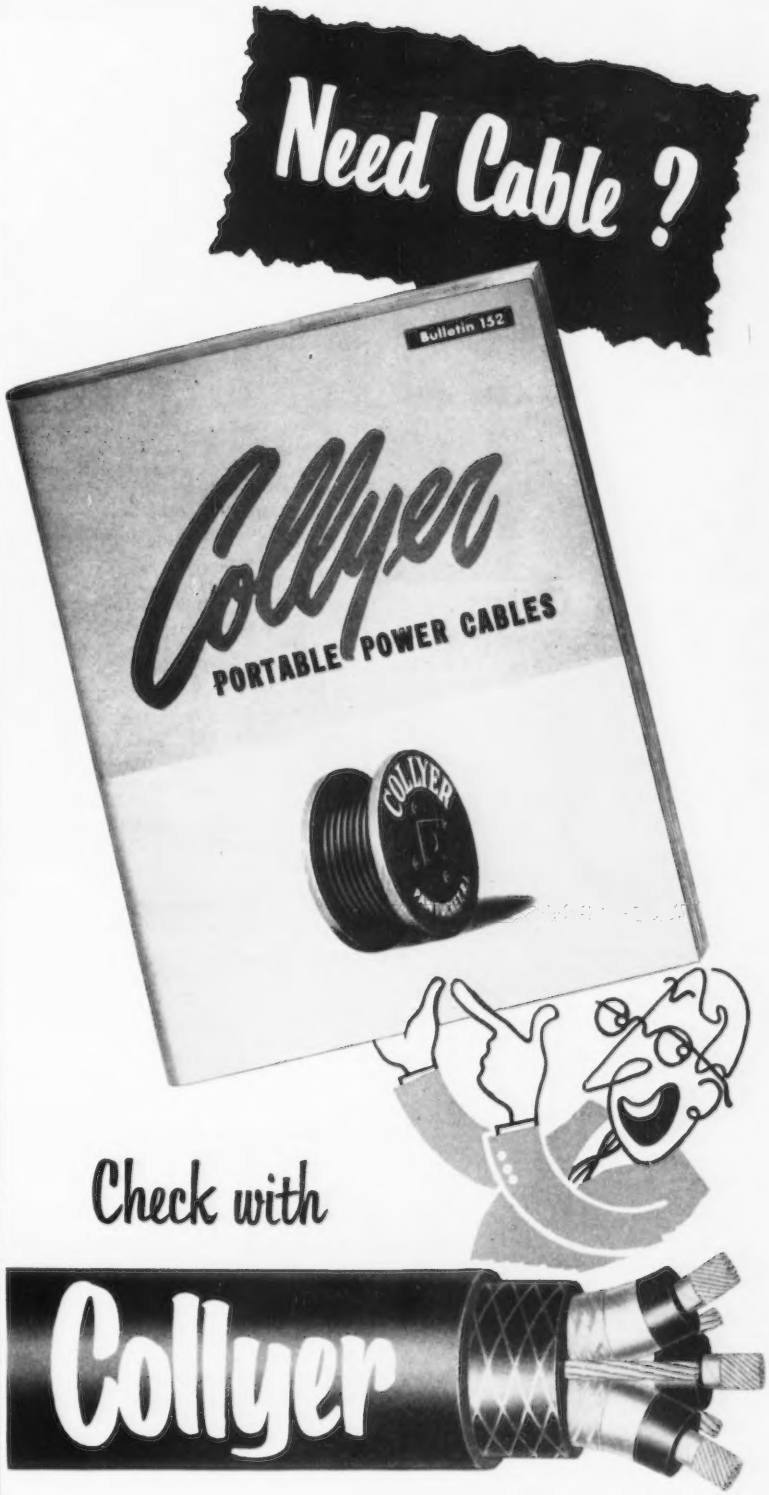
WASHINGTON

★**Pacific Northwest Alloys, Inc.,** Spokane, a subsidiary of Chromium Mining & Smelting Corp., Canada, has leased the Government-owned Mead magnesium plant for production of ferrochrome. The company shut down 200 of the magnesium furnaces early in June, H. B. Megill, executive vice-president and general manager reported. Three ferrosilicon furnaces were shut down in May under a Government closure order.

The Pacific company will pay the Government an annual minimum rental of $158,000, plus 3% on its gross sales up to $18 million, and 2% on gross sales above that amount. Under the lease the plant may be reconverted to produce magnesium on short notice if the need should arise. The ferrochrome will be produced in four furnaces which have been turning out ferrosilicon, Megill said. Production of 1,800,000 lbs. of ferrochrome per month will be possible from each furnace, with the plant's monthly production eventually totaling more than 7-million pounds. The initial ferrochrome operation will employ about 200. About 400 will ultimately be employed while the peak payroll under the Government contract was 1,150.

Some $1,500,000 will be spent by Pacific Northwest Alloys on reconversion during the next few months. Much of this amount will be spent on altering kilns to handle lower grade chrome ore and additional vacuum equipment. Only one furnace will be used at first. This will require the use of about 50 of the reduction furnaces. The lease negotiated is for 10 years, with an option for 10 additional years. The company has an option to purchase the facility after three years. The company is negotiating with the Government to get low-grade ore in a stockpile in Montana. It also will get ore from the Philippines, Turkey and South Africa.

★**Pend Oreille Mines & Metals Co.,** the state's largest lead-zinc producer, has reduced operating costs $1.23 per ton in the past two years, a company



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Washington *(Continued)*

official reported. Cost reductions reportedly were made possible by increased tonnage and the installation of trackless mining equipment.

Operating costs in 1951 amounted to $4.56 per ton. In 1952, this figure was reduced to $4.07. During the first five months of this year, operating costs were lowered still further to $3.33 per ton.

Production rate now is reportedly between 500,000 and 600,000 a year, against 356,205 tons a year ago.

Pend Oreille is controlled by Sullivan Mining Co., jointly owned by Bunker Hill & Sullivan Mining & Concentrating Co. and Hecla Mining Co.

Sullivan Mining Co., which operates the Metaline Mining & Leasing Co.'s property in the Metaline district, reported that development had reached a point where production of 300 tons per day appears possible.

★**Bonanza Lead mine** in the Colville district is again producing ore. New development work has disclosed new ore on the 400 and 600-ft. levels. Production now runs 100 tons daily. In June, 800 tons of ore running 22% lead and 6-oz. of silver to the ton was milled. Some $50,000 has been spent in revamping the mill thus far.

★**Chewelah Copper Co.** is constructing a 250-ton log ore bin at the recently opened Copper King mine on Eagle Mountain northeast of Chewelah. The bin is located near the portal of the lower Copper King tunnel which has just been reopened. Reconditioning of an old ore bin is in progress near the portal of the 400-ft. level adit of the United Copper mine nearby.

★**Operations** have been resumed at Germania Consolidated Mines' tungsten property in Stevens County where bulldozing has uncovered a promising show of tungsten.

★**Kromona Mines Corp.** which spent $112,336 on development at its copper-gold-silver-tungsten property in the Sultan district of Snohomish County added $60,000 worth of mining and milling equipment in June. Construction of a 100-ton flotation plant was started last fall. A 1,000-ft. mine-to-mill tram is being installed and buildings have been constructed at the mine.

★**Reynolds Metals Co.'s** plant at Longview for recovery of cryolite went into operation in June. Plant fumes and the carbon linings of the aluminum reduction potlines are the source of the cryolite. This provides the operations with a self sufficient supply of the powdery material for the aluminum reduction process.

★**Kaiser Engineers,** major construction contractors at the Hanford Atomic Works, announced in June that they were employing 5,842 workers. The firm holds a $110-million expansion contract and has a weekly payroll of more than $600,000.

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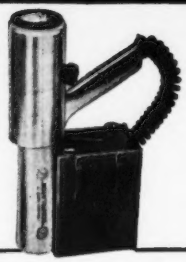

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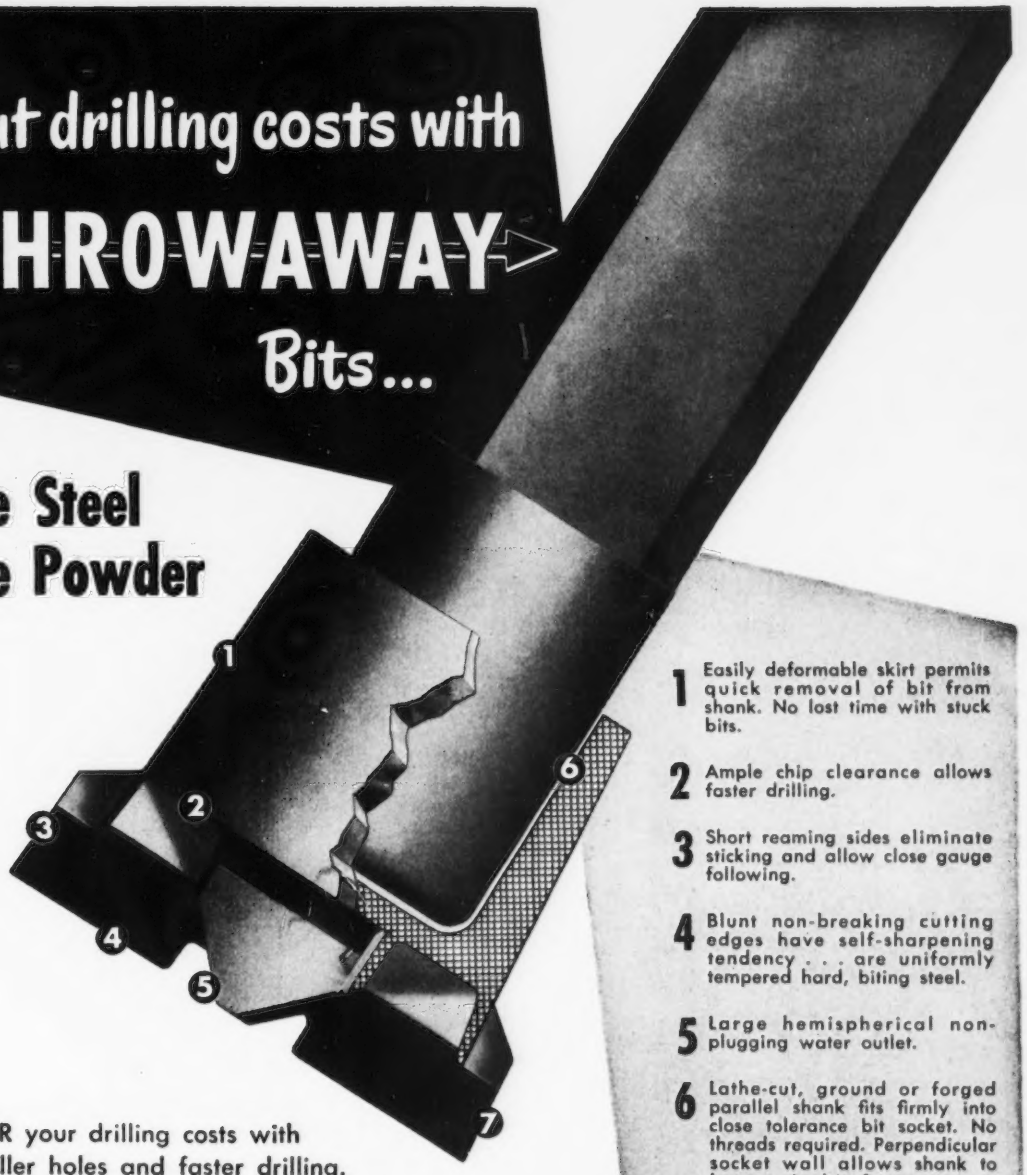

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IN CANADA

MANITOBA

★**Sand River Gold Mining Co.** has acquired 33 claims under option, and staked 18 more, covering a nickel-copper-zinc prospect in the Knight Lake area of Northern Manitoba. Preliminary prospecting has disclosed several sulphide zones. Drilling equipment has been flown in to the property.

★**Roxy Gold Mines** has begun exploration of claims on the Manitoba-Ontario boundary and believed to be along the strike of the copper-gold prospect now being drilled at High Lake by San Antonio and associated companies (see *E&MJ*, June, 1953).

★**Forty-Four Mines**, subsidiary of San Antonio Gold Mines, reports that promising results have been returned by drill holes in Forty-Four ground near the hanging wall on the 19th level. Plans are to start production during 1954 when Forty-Four will take over as much of the San Antonio mill capacity as can be spared.

San Antonio Gold Mines reports that diamond drilling on the 18th and 19th levels of the mine has disclosed a number of ore sections that may indicate a new ore body. The new development is south of the center of the mine in previously unexplored ground.

★**Quebec Nickel Corp. Ltd.** reportedly plans to fly in necessary equipment to begin shaft sinking in August at huge copper and nickel deposits 30 miles north of Minaki, a few miles east of the Manitoba boundary.

Rich core samplings have spurred enthusiastic company officials into using air transport rather than waiting for freeze-up when supplies and equipment could be moved in by tractor. The company began work there only 12 months ago.

There is said to be no question any longer whether a mill will be installed. The only point yet to be decided is the tonnage.

Indications are that the first shaft will be sunk near the Gordon Lake zone but final decisions await additional diamond drilling results. The promising deposits stretch some 17 miles.

In the Gordon Lake zone, a relatively small area, company officials say that completed drill holes show good mining widths of 10 to 15 ft. with an indicated and continuous length of 2,900 ft. They anticipate that further diamond drilling will add to a previous estimate of 5-million tons of ore in this section.

To head off property disputes, the QNC is said to have blanketed the area, staking upwards of 230 claims which embrace the entire 17 miles of mineralized zone. There is prospect of a nickel smelter being started near the property.

ONTARIO

★**At Windsor,** Winston Brothers Co., Minneapolis, Minn., have a contract to sink a shaft for the Canadian Rock Salt Co. In that vicinity the salt strata are about 1,100 ft. beneath the surface. The first 700 ft. (60 ft. of soil covering, plus 640 ft. of a mixture of sandstone, limestone and gypsum) are water-bearing, and to make penetration it will be necessary to freeze the top 720 ft. It is a job requiring an abundance of technical skill, to say nothing of money expenditure. Preparatory work is just getting under way.

★**At Fecunis Lake,** near Levack, Falconbridge Nickel Mines are clearing site for development of the Fecunis mine. It is a major undertaking. The sinking of two shafts will be underway shortly.

★**Algoma Ore Properties** soon will boast one of Canada's largest single underground mining operations. The company, mining-exploration adjunct of Algoma Steel Corp., is readying its new sinter plant addition, designed to increase ouput of premium grade sintered iron ore to 1.5-million tons per year. To feed the expanded plant, some 2.25-million tons of raw ore will have to be mined annually.

The company's field exploration program, which has been accelerated generally, is now concentrated in the Michipicoten area a few miles north of Sault Ste. Marie.

★**Shortage of** adequately trained personnel is reflected in the Ontario Mines Department scheduled plan to send only 11 geological parties into the field this year.

The 11 parties, fewer than in recent years, will have their hands full. Program aims include mapping of favorable prospecting areas, examination of mineral occurrences and the collection of data on groundwater resources.

Field party personnel will include 27 student assistants, recruited mainly from Canadian universities.

Department geologists resident in principal mining districts will gather information on areas not covered by the field parties, according to Mines Minister Philip T. Kelly.

Areas or projects to be investigated include the Emo area, Rainy River district; Jackfish-Middleton area, Thunder Bay district; Boston Twp., Timiskaming district; Cobalt area, Timiskaming district; Kyanite occurences, Sudbury and Nipissing districts; Gladstone Twp., Algoma district; Sudbury area; Lount Twp., Parry Sound district; Southeastern Ontario; Peel Co., and Carlow and Mayo Twps., Hastings Co.

Program of field work was organized by Dr. M. E. Hurst, provincial geologist.

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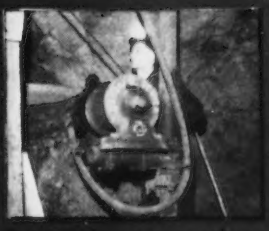

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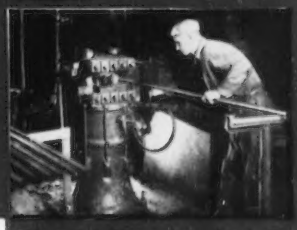

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QUEBEC

★**At Asbestos, Canadian Johns-Manville** has let a contract to John MacIsaac, of Sudbury, Ont., to sink a new production shaft. The job is well underway. Excellent progress is being made.

★**Weedon Pyrite & Copper Corp.** has closed contracts for the sale of its entire output for concentrate for the next five years, according to R. Robertson, president of the company. Some 200,000 tons is involved in these sales. In addition, the company will supply 15,000 tons during the next two years to a Canadian paper mill.

★**Quebec Hydro-Electric Commission** has been authorized to spend $4-million for the construction of a power line to the Chibougamau mining district, according to a recent announcement by Premier Maurice Duplessis of Quebec. First power may be delivered by 1955. Properties which are expected to use this power include Campbell Chibougamau, Opemiska Copper Mines and Chibougamau Explorers.

★**Quebec Manitou** is reported to have acquired copper holdings in the White Mountains in New Hampshire near the Vermont border. Exploration work has revealed copper-silver values in mineralized zones.

NEW BRUNSWICK

★**New Brunswick's Bathurst area** continues to maintain its spotlight position in mining news because of the major exploration boom set off there by the now-famous Brunswick Mining & Smelting Co. discovery. (See *E&MJ*, May, 1953).

Success of aeromagnetic methods in revealing the initial discovery and pointing the way to other favorable zones has led to widespread use of geophysical methods in the area. Resistivity, self-potential, electromagnetic, and geochemical methods are all being used to delimit favorable zones for further prospecting by the more direct diamond-drilling method.

★**Anacon-Leadridge** has picked up the main orebody in Hole No. 9, according to the *Northern Miner*, which reports that this confirms the fact that the first intersection (73.5 ft. from 298.5 to 372 ft.) represents new and parallel ore. The main intersection shows 96.5 ft. of massive lead-zinc sulphides starting at 671 ft.

★**Keymet Mines**, near the Anacon property, plans a 200-ton mill. Drifting is now in progress on three levels, and the shaft will be deepened to permit drifting on two additional levels.

★**United Montauban Mines** expects to be in production late this summer and plans to operate its new 500-ton mill.

BRITISH COLUMBIA

★**Production of nickel** for U. S. defense is scheduled to start at a British Columbia mine by March 1, 1955, at a rate of 6-million lb. a year, minimum, provided exploration and development work prove satisfactory.

The preparatory program, which is being undertaken by Western Nickel, a wholly-owned subsidiary of Pacific Nickel Mines Ltd. of Vancouver and Newmont Mining Corporation of New York, at the Pacific Nickel property near Choate, 100 miles east of Vancouver, is sparked by a contract from DMPA and will cost over $1-million.

The whole project—to start of production—will involve about $4,750,000. Contract is for 42-million lb. of nickel at the rate of 6-million lb. per year for seven years. First step will be completion of exploration of the orebody by Sept. 30 this year at an estimated cost of $425,000. The company then will proceed with development of the property, the work to be completed by May 31, 1954, at a cost of $750,000. Then, if the company and the U. S. government agree to proceed with production, the government will advance up to $2,625,000 and the company will put up $960,000, and production will be scheduled for March 1, 1954. All U. S. government advances are repayable with interest as production proceeds.

★**Silbak Premier Mines Ltd.**, which earlier this year suspended operations in the Portland Canal area, will have $100,000 in cash after payment of all debts, and does not contemplate liquidation, it was announced at the annual meeting in Vancouver by Dale L. Pitt, managing director. Closure was due to low base metal prices and operating difficulties, including failure of an important diesel unit. The mill be reopened if prices improve, Pitt said. Silbak also was operating Indian Mines (1946) Ltd. and Premier Border Gold Mining Co.

★**Vast mineral resources** in the area of northern B. C. where the Ventures-Frobisher empire plans a multi-million dollar hydro and metallurgical development are revealed in a study by Canadian Government Geologist H. S. Bostock.

He says widely scattered outcroppings of good iron ore have been found at intervals between Wind River and the head of Stewart River, indicating a late pre-Cambrian deposit of hexmatite.

The same iron formation has been traced from near the head of Bonnet Plume River, where it was found several hundred feet thick, for 130 miles in a southeasterly direction through the Hess mountains and the easternmost part of the Selwyn range, indicating an orebody ranking with the world's largest. Federal experts who have examined samples label it similar in quality and grade to the Lake Superior iron ores.

Other discoveries include platinum,

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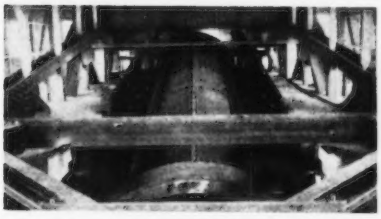

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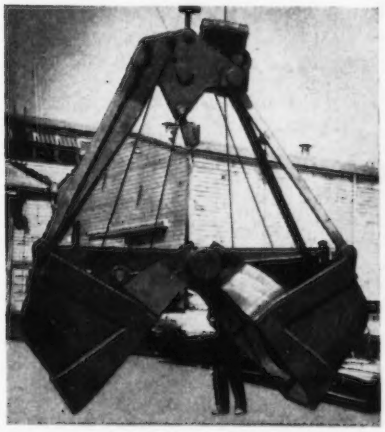

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discovered in quantity in association with nickel, copper, cobalt and zinc in the St. Elias range, palladium, silver, mercury, tin, bismuth, barium, and monazite containing thorium now obtained for atomic purposes from Brazil and South America.

★**Silver Ridge Mining Corp.** plans construction of a 150-ton mill at its Sandon property in the Slocan. Lead and zinc concentrates are to be shipped to Idaho under a contract already signed. Meanwhile, the company is seeking to lease one of the idle mills in the Slocan area for treatment of development ore. The Wonderful vein, principal deposit in the mine, has been intersected by the crosscut on the 4-level, showing an 18-ft. width with a 6-ft. section assaying 8% lead and 12% zinc.

★**Canadian Exploration Co. Ltd.,** has completed its multimillion dollar expansion program started two years ago at Salmo. Now in operation is its new $1.5-million conveyor system from the mine working.. to the Emerald tungsten mill and the Jersey lead-zinc mill more than 2,000 ft. below. The conveyor will handle the entire output of lead, zinc and tungsten, distributing ore to each mill by a remote control system. Production costs are expected to be sharply reduced.

★**Vancouver tugs,** towing bulk carriers, have started shipment of copper ore from Consolidated Mining & Smelting Co.'s new copper-zinc property being developed at Tulsequah to Tacoma smelter. Three shipments of 1,600 tons each are scheduled, to be followed by three shipments of zinc ore to Cominco smelter at Trail via Vancouver. The ore is first shipped from the Taku River from Tulsequah, just east of the Alaska peninsula and south of Atlin, to Taku on flat steel shallow-draft barges and then transshipped to bulk carriers.

Another 200 tons of copper ore has been shipped to Tacoma from a recent development at Deepwater Bay, the north end of Quadra Island, where ore was discovered by Adams Bros Mining Co.

★**A copper showing,** reported to be impressive, has been staked near Vancouver by a Britannia Mining & Smelting Co. Ltd. prospector. The claims are mostly in Mount Seymour Park, across the harbor (Burrard Inlet) from Vancouver and Burnaby. They also run below the park down to the water on Indian Arm of the Inlet. E. C. Roper, Britannia manager, says the claims show evidence of a shear zone and are adjacent to others held by the company.

★**The name of** Glacier Gulch Mining Co. Ltd., which owns silver-lead-zinc properties on Hudson's Bay Mountain near Smithers has been changed to Twin Falls Mining Co. Ltd. In another action at the shareholders meeting, the company dropped its options to buy the Wade and Jessie groups.

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SASKATCHEWAN

★**Golden Slipper Mines Ltd.** of Vancouver has acquired an option to purchase a group of 19 claims four miles northeast of the main property of Eldorado Mining & Refining (1944) Ltd. at Beaverlodge Lake. The group adjoins Eldorado's Donaldson Lake property.

IN LATIN AMERICA

MEXICO

★**Cooperative Las Esperanzas** mines, Coahuila, has appealed to the Labor Ministry for cash aid, pleading that unless help is forthcoming, its workers will be thrown out of work.

★**Altos Hornos de Mexico, S. A.,** government-operated iron-steel works at Monclova, Coahuila, estimating a 1953 record production of 200,000 tons, has scheduled improvements costing $20,800,000, to be completed about mid-1954.

★**Cananea Consolidated Copper's** plan to work low-grade copper deposits at Cananea, Sonora, reportedly involves a $17,200,000 investment. Cananea estimates that the enterprise will enable it to continue until at least 1973 its present annual copper production of 330,000 metric tons.

★**Refined silver** was a leader in Mexican exports during the first third of 1953. Shipments amounted to 311,820 kg., valued at $8,112,500. This bettered the record for the same period in 1952 by 146,114 kg.

★**River and lake waters** heretofore used exclusively by the Tiro de San Augustin mine, Guadalupe, Zacatecas, have been declared national properties by Pres. Adolfo Ruiz Cortines, who placed them under the jurisdiction of the Hydraulic Resources Ministry.

VENEZUELA

★**Mining interests here** have organized the Venezuela Chamber of Mines (Cámara Venezolana de La Mineria), sponsored by the Venezuelan Mining Association. One of the first projects planned is the formation of a Miners' Credit Bank.

The Chamber has set as its goals the backing of the federal government for mineral development, the census and cataloguing of the nation's mineral resources and the encouragement of instruction in theory and practice of mining. In connection with the first-named objective, it has been mentioned that assistance of the National Development Corporation (Corporación Venezolana de Fomento) will be sought in the establishment of a bank to finance mineral exploration and development.

PERU

★**Minas de Venturosa** began operating a new mill for lead, zinc and copper concentrates May 20. The mill has a capacity of about 120 tons of ore per day. At present, production of zinc concentrate is said to be unprofitable and it is being stockpiled at the mill.

★**Cia Minera Atacocha,** lead-zinc producer with a 500-ton capacity mill, has begun operation of a hydroelectric power plant of 5,300 hp. Plans call for stepping up power to 8,000 hp. Company is aiming at producing its own power which heretofore has been purchased from the Cerro de Pasco Corp.

IN AUSTRALIA

★**Development of Australian uranium** resources is proceeding at a satisfactory pace although strict security regulations prevent the publication of figures.

Considerable progress is reported from Rum Jungle where private enterprise has been allowed to develop the fields for the government; less spectacular progress has been reported from South Australia. It seems now that for the time being Australia will concentrate on these two major uranium fields and that further investigation of several reported discoveries would not receive the expected degree of support.

The next Australian expedition to Antarctica also will be engaged on a search for uranium in what is claimed to be Australian part of the Antarctica.

★**Renewed interest** is being evinced in Australian gold production which shows again an increase over recent years. Among the reasons for this attitude are expectation of a depreciation of the Australian currency, greater availability of manpower and materials for the gold-mining industry, and speculation on the possible increase of the price of gold.

★**Production of silver** also has increased by some 10% over figures for the last year. Australian production of zinc is now running at close to 200,000 tons a year and that of lead at about 235,000 tons a year.

★**The important** 20% income tax concession on metals and minerals has been extended for another seven years to 1960. New metals added include ores of bismuth, selenium, columbium, platinum, osmiridium and tellurium. Several minerals have also been added to the list which comprises now zircon, ilmenite, chromite, vermiculite, fluorspar, monazite and pyrite.

★**Australia's mica** mining industry is undergoing a crisis and from Hart's

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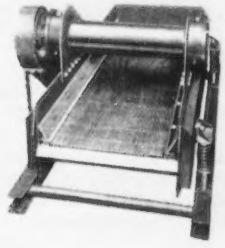

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Range,* the principal mica field, reports are coming of the closing of a number of mines. Manpower, always difficult to get for hard work at Hart's Range, is now beginning to drift from the field. The crisis is mostly due to a decision by the government-operated mica pool not to buy certain sizes of mica. It is claimed that in view of this decision mica mining became unprofitable.

★**Resumption of free trading** in copper on the London metals market in August is expected to hit Australian producers. Unless the fall in price is considerable, most of the large Australian producers, including the American-controlled Mt. Isa, are expected to survive the fall in values. However, activities in the Northern territory will certainly be affected.

★**Gold production** of the Western Mining Corp. group of companies rose sharply in its last financial year and reached 187,858 oz. of gold (previous 132,247 oz.). Value of the output exceeded £3-million.

★**United States** and Great Britain through a combined agency for the development of atomic energy have advanced the equivalent of $2,475,000 during the past five months to develop the Rum Jungle uranium field near Darwin. News reports say that the combined agency plans to advance another $2-million during the current financial year, and thereafter uranium sales are expected to be adequate to finance further development. A refinery is now being shipped to Rum Jungle to produce uranium oxide, and first commercial shipments are scheduled for next year.

TASMANIA

★**Aberfoyle Tin N. L.** has struck a new 24-in. vein at a depth of 1,053 ft. The vein is a completely new development which may prove to be of major importance when fully explored. Shaft sinking has now reached a depth of 1,062 ft., about 75 ft. below the new No. 9 level. The new vein was on a granite floor.

★**Montana Silver-Lead N. L.** in its recent reported crushing announces milling 790 tons of ore yielding 100.5 tons of concentrates assaying 67% lead and 87 oz. silver a ton.

NEW SOUTH WALES

★**Production of minerals** and metals reflects increases in cadmium, lead, silver and zinc but output of gold and copper has dropped. The mineral sands industry, a good dollar earner, is developing steadily. Output of this industry now exceeds that of any other mining industry except silver-lead-zinc and coal.

★**Tungsten Consolidated Ltd.** will treat about 140 tons of ore a week

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Controlled overspray of Roylac Aluminum prevents spattered background surfaces

The special vehicle and solvents in Roylac Aluminum permit safe spray-painting where background surface spatter must be avoided. In the test below, identical spray-guns, with identical adjustments, are connected to the same compressed air source. One gun contains Roylac, the other another high grade aluminum paint.

A tarpaper background was placed four feet beyond the wire fence for this comparison test. The nearest gun contains Roylac. Roylac Aluminum dries in motion within four feet of the gun, falling away as a cottony, non-adherent powder.

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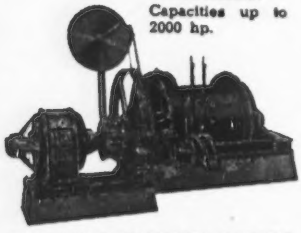

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New South Wales *(Continued)*

from now on and about £100,000 ($280,000) is expected to be spent on development and the purchase of additional plant facilities. Plant capacity was being increased to handle 300 tons a week.

IN EUROPE

GERMANY

★**The U. S. Government** has made a loan of 10-million marks (about $250-million) to the Vereinigte Aluminium Werke AG, Bonn, for the reconstruction of its aluminum smelting plant at Grevenbroich. Total reconstruction costs of the plant are estimated at about 40 million marks (about $10-million).

The loan was made under the Mutual Security Agency's Basic Materials Program, which is intended to reduce the drain on United States resources and assure the production of adequate supplies of materials for Western defense.

The Grevenbroich plant is expected to have an annual production capacity of 15,000 tons of primary aluminum. Reconstruction is expected to be completed by the end of this year.

Two other smelting plants of the Vereinigte Aluminium Werke, at Toeging and Luenen, already have been rebuilt, with the aid of U. S. funds Under the terms of the loan, the U. S Government has an option on aluminum produced by the Vereinigte Aluminium Werke.

BELGIUM

★**Two Belgian engineers** studying new earth and rock fill dams and construction methods in the United States prior to development of hydroelectric site in Belgian Congo in Africa toured the Yale project of Pacific Power & Light Co. June 19.

G. Pahud, director of the Societe de Traction et d'Electricite of Brussels, an engineering firm, and L. Binet, a director of Union Miniere de Haut Katanga, were accompanied over the project by PP&L's construction superintendent, Frank L. Beadle.

Binet reported that his company, which mines and smelts ores in the Belgian Congo, plans a 260-ft. high earth fill dam to produce power for its Katanga project near copper mining operations.

THE NETHERLANDS

★**The 1953 outlook** for the tin industry is favorable according to the annual report of the Billiton Tin Company. Combined tin output of Billiton and

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Singkep increased to 12,900 tons in the operating year ended May 31, 1953, compared with 12,100 tons in the preceding year.

The report said that output of bauxite on Bintan Island (Indonesia) had to be reduced. Freight tariffs had been so high that sales on the European market had declined heavily. Discussions on the Bintan situation with Indonesian Government had been initiated.

Surinam bauxite production was maintained at about the same level as in the preceding operating year. Sales were assured until the middle of 1954, while negotiations for new contracts had been opened.

The company had cooperated in a geological study on behalf of the Surinam Government, concerning the construction of a dam, the setting up an aluminum industry and sales opportunities for aluminum.

FRANCE

★**Mine expansion** in metropolitan France is indicated by the production rates for 1952 as compared with 1951 for the following projects:

★**Societe des Mines de la Pagne.** Mine: La Plange. Product: Galena. Production; 1,953 metric tons in 1951; 3,521 metric tons in 1952.

★**Societe des Mines des Malines.** Mine: Les Malines. Product: Lead-zinc. Production: Zinc, 7,381 metric tons in 1951; 7,656 metric tons in 1952. **Lead,** 2,194 metric tons in 1951, and 2,683 tons in 1952.

★**Societe Nantaise des Minerais de Cassiterite.** Mine: Abbaretz. Product: Tin, 70% cassiterite. Production: 27 metric tons in 1951; 291 metric tons in 1952.

★**Compagnie Miniere des Montmins.** Mine: Montmins. Product: Tungsten, 65%. Production: 369 metric tons in 1951; 442 metric tons in 1952.

IN AFRICA

★**Export-Import Bank** announced in Johannesburg that it has agreed to lend the Rhodesia Congo Border Power Corp. up to $22,400,000 to finance increased power supplies. Expanded power would enable mining companies on the Northern Rhodesia Copper Belt to step up production of copper and cobalt. The loan is to be repaid between 1957-1962 from copper and cobalt sales to the U. S. government's DMPA.

To increase power supplies, the Power corporation is to arrange with four copper mining companies to extend their thermal power stations so that by 1956, sufficient power may be available to meet estimated Copper Belt demands at that time. The power build-up is subject to availability of

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Africa *(Continued)*

coal supplies. Four mining companies involved are Roan Antelope, Mufulira, Nchanga and Rhokana. From 1957 onward, new mines in the area are expected to swell the demand for power.

★**Diamond gem stone sales** for the first five months of 1953 have approached $60-million, approximately the same figure for the corresponding period last year. This was announced by Sir Ernest Oppenheimer at the annual meeting of De Beers Consolidated Ltd. Sir Ernest added that a reduction in demand was expected over the remainder of the year. At the same time it was announced that sales of industrial diamonds for the first five months have declined from $33-million to $19-million. This was largely ascribed to virtual cessation at the end of 1952 of purchases for stockpiling. Sir Ernest estimated that industrial sales for 1953 would be about $36.5-million.

★**Prevention of Accidents Committee** of the Transvaal Chamber of Mines proudly announced that since the Committee was formed in 1913, the accident rate per 1,000 has dropped from 3.81 to 1.69.

★**Nchanga Consolidated Copper** mines operating in Northern Rhodesia in three years have increased profits before taxation from $4.3-million to $39-million.

★**Consolidated Murchison,** which operates antimony mines in eastern Transvaal, has announced a drop in profits, from $9.5-million for 1951 to $1.9-million for 1952. Much of the property is now in a caretaking basis, to be reopened when the antimony market improves.

★**Two additional** uranium recovery plants have been officially opened on the Witwatersrand at the Daggafontein and Blyvooruitzicht Gold Mining Cos.

★**South African Geological Survey** has begun a new industry: the mining and refining of clay minerals essential in the oil-from-coal, iron molding and insecticide industries. The Council for Scientific & Industrial Research has set up pilot plants for recovery of Fuller's Earth and montmorillonite in central Transvaal. Deposits exist over an area of 54 sq. mi. It is hoped that the yield will be sufficient for export. The research stemmed from a farmer's query whether the rock, if ground, would be suitable for whitewash. Until that time, there were no known deposits of Fuller's Earth in the country.

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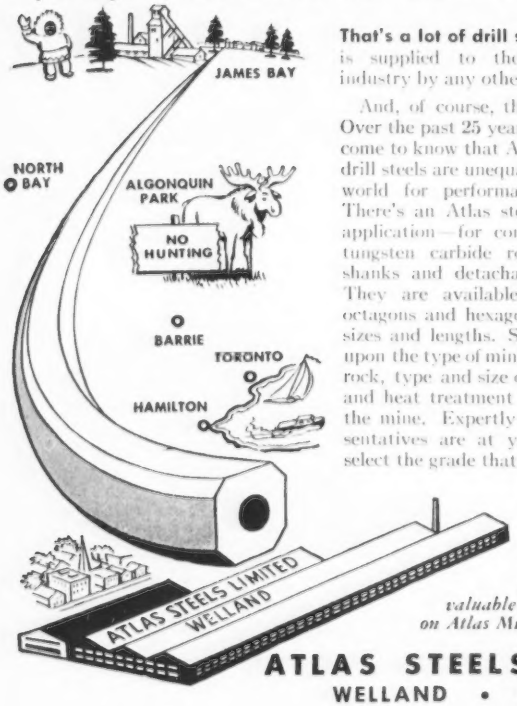

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ALGERIA

★**Increase in mineral output for 1952** as compared with 1951 indicates the importance of the following mine development projects now under way in Algeria:

★**Societe des Mines de Zellidja.** Mine: Ain Zounder. Product: Zinc concentrate, 55%. Production: Nil in 1951, 3,589 metric tons in 1952.

★**Compagnie des Mines d'Ouasts et de Mesloula.** Mine: Ouasta Mesloula. Product: Galena, 55%. Production: 1,600 metric tons in 1951, 2069 metric tons in 1952.

★**Societe des Mines de Sidi-Kamber.** Mine: Sidi Kamber. Product: Galena, 72%. Production: Nil in 1951; 686 metric tons in 1952.

TUNISIA

★**Increase in mineral output** for 1952 as compared with 1951 indicates the importance of the following mine development programs under way in Tunisia:

★**Societe Miniere et Metallurgique de Pennaroya.** Mine: Kef Chambi. Product: Galena, 62%. Production: 286 metric tons in 1951, 1,488 metric tons in 1952.

★**Compagnie Royale Asturienne des Mines.** Mine: Djebel Semene. Product: Galena, 60%. Production: 3,485 metric tons in 1951, 5,915 metric tons in 1952.

MOROCCO

★**Increase in mineral output for 1952** as compared with 1951 indicates the importance of the following mine developments now under way in Morocco:

IN THE PHILIPPINES

★**Gold production** from the nine straight gold mines in the Philippines was valued at 2,622,400 pesos in May at the statutory price or at 3,815,600 pesos at the open market price which was actually realized. During May, the Manila open market averaged about 100 pesos per oz.

During the month, the gold mining companies milled 158,300 tons, averaging 0.236 oz. gold per ton. This was a lower grade than was milled in May 1952, when 143,500 tons were milled averaging 0.286 oz. per ton.

Increases in tons milled were made by Baguio Gold, Benguet, Balatoc, Itogen, San Mauricio, and Surigao Consolidated. Atok and Mindanao Mother Lode milled at a lower rate than a year ago.

In the accompanying table the milling rate and gold recovery at the statutory rate are shown for the gold mining companies for May 1953 contrasted with May 1952.

★**Paracale Gumaus**, an important prewar gold mine in the Paracale area, has made an agreement with Demonstration Gold Mining Co., by which the latter will mill Gumaus' ore at its new 150-ton mill, provided Gumaus can get back into operation. Demonstration expects to mine ore from the old Santa Barbara property in Paracale.

★**Good progress is reported** on railroad construction from tidewater to the Consolidated Mines chromite property in Zambales. The railroad should be in operation early in 1954. Shipments of chrome ore are being made by trucks, and have averaged about 36,000 tons per month, somewhat lower than the monthly rate in 1952. Some difficulty has been encountered with high silica content and in an effort to do cleaner mining, shipments have declined. Additional heavy media equipment is being installed.

★**Philippine Iron Mines**, operating at Larap, report steadily increasing output. A new record was established in May with shipments of 70,900 tons to Japan, valued at 1,439,000 pesos. For the January-May period of this year, 295,200 tons were shipped valued at nearly 6-million pesos.

★**Acoje Mining Co.** shipped 7,400 tons of metallurgical grade chromite in May, valued at 503,000 pesos, or about $33 per ton.

★**Reynolds Metals Co.**, of Virginia, proposes to establish rolling mills for the manufacture of aluminum articles in the Philippines near Manila, according to George M. Morten, foreign economic adviser to the Reynolds firm. The plant will cost $3.5-million. Of this total $2-million will be expended on heavy machinery and equipment which will come directly from the U. S. The firm will supply half of the total

Tonnage and Value of Philippine Gold Mine Output, May 1953

Mine	Tons Milled		Value of Production	
	May, 1953	May, 1952	May, 1953	May, 1952
Atok	9,500	13,500	107,200	247,400
Baguio Gold	11,400	7,400	196,200	136,900
Balatoc	43,000	38,600	517,100	577,600
Benguet	44,200	36,500	595,600	560,700
Itogen	15,700	14,200	202,800	258,000
Mindanao Mother Lode	11,000	12,800	308,400	287,600
Surigao	13,300	12,700	315,500	411,500
United Paracale	Suspended	4,000	0	81,800

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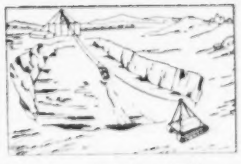
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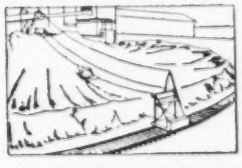
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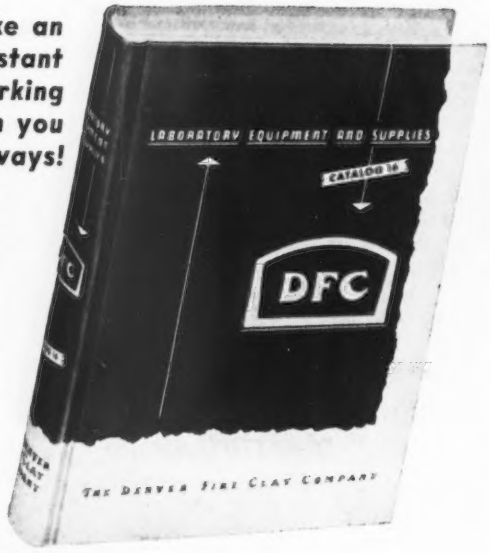

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Philippines *(Continued)*

investment and Philippine interests the rest. Work will be started as soon as the firm has been granted tax exemption by the Philippine Government. Initial output will be 7-million lb. of aluminum a year. This will be more than enough to meet normal industrial demand in the Philippines. The raw material, aluminum pig, will be imported from the U. S. at first. By 1956 the National Power Corp. is expected to have completed a generator of 50,000 kw. It will then be possible for the Reynolds firm to establish its aluminum plant at Mindanao.

Silver Profits Tax

(Continued from page 77)

portant to silver fabricators. The Government, in short, saw those engaged in silver fabrication and the like—such as Handy and Harman—as not being seriously injured by the tax.

Conclusions

If Handy and Harman were to revert to their 1947 attitude, if the silver users were to agree to repeal of the tax, and if the whole market presented a united front on the matter, it is possible that the Republican Administration would grant what the producers, the silver senators and brokerage interests long have wanted—repeal of the tax. Presumably a compromise might be worked out to overcome the past Treasury objections to tax repeal. That is, if the tax were repealed subject to reimposition by the executive branch in the event of resumption of Treasury silver buying, with advance notice to the public, the need for the tax would be removed.

A resumption of silver futures trading in New York would of course reintroduce speculation. Therein lies one possible danger not heretofore mentioned. Should we experience another depression, inflationists would come out of their holes brandishing all sorts of monetary nostra including demands for activation of the Silver Purchase Act. The speculators would not only be gambling on Government action; they would prod the Government into action, as Father Coughlin and the Committee for the Nation did in 1933 and 1934. Such speculation and such prodding gave us the 1934 act that contains the tax that stopped the trading and the speculating in silver.

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If you have any kind of a suspension-recovery problem—whether dust, fly ash, fume, fog or mists—it will pay you to bring it to the leading organization in the field . . . WESTERN PRECIPITATION CORPORATION. Western Precipitation not only pioneered, over 44 years ago, the first commercial application of the now-famous COTTRELL Electrical Precipitators, but also has been a leader for many years in the *mechanical* recovery field with its widely-accepted MULTICLONE Collectors.

Result:

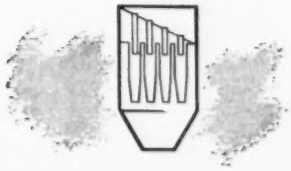
Western Precipitation is unsurpassed in the all-important factor of "know-how" in BOTH the electrical and mechanical fields . . . knows from years of first-hand experience whether your particular problem can best be solved by mechanical or electrical methods—*or by a combination of the two* . . . can give you a direct and unbiased recommendation on the matter . . . and then can provide the complete installation under *one* responsibility, *one* overall performance guarantee, even where Combination Multiclone-Precipitator (CMP) installations are made!

Western Precipitation products and services include . . .

COTTRELL

Electrical Precipitators

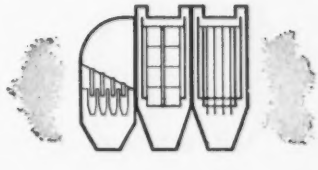
. . . the most efficient recovery equipment for high recovery, long life, low maintenance on practically any type of suspensions, wet or dry. COTTRELLS can be designed to handle a few c.f.m. —or millions—with equal ease, and at virtually any operating temperature. Recovery efficiencies closely approach 100% recovery, if desired, with very low draft loss, minimum power costs and negligible labor costs. *By all standards, Western Precipitation* COTTRELLS *give highest recovery at lowest cost per-year-of-service!*



MULTICLONE

Mechanical Collectors

. . . the most efficient, most compact, most trouble-free mechanical equipment for recovering suspensions from gases. Because of their unique small-tube design, MULTICLONES are unsurpassed in mechanical recovery efficiencies—require less space, less maintenance, and are far simpler to install. No filters or screens to replace, nothing to burn or cause fire hazards, no high speed moving parts to repair or replace. These and many other advantages make MULTICLONE Collectors the logical choice on installations where mechanical recovery is selected.



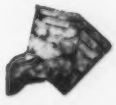
CMP UNITS

(Combination Multiclone-Precipitator)

. . . combine, in *one* compact installation, *both* mechanical and electrical recovery principles so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally removes the larger and heavier suspensions (down to a few microns in diameter) . . . and the COTTRELL section then electrically removes the very small particles remaining in the gases. Thus, the bulk of the recovery is obtained with relatively low-cost equipment, and the final clean-up is obtained with equipment having unusually high recovery efficiency—approaching theoretically perfect, if desired.

The recovery of suspensions from gases is a highly exact science and every problem is different. Some require mechanical methods—others electrical methods—still others a combination of mechanical and electrical methods in proper balance to meet the individual requirements of each application. No matter what your problem, remember that only Western Precipitation has had years of field experience in BOTH mechanical and electrical methods!

Send for descriptive literature!



Let our experienced engineers study your recovery requirements and make an unbiased recommendation on the equipment best suited to your particular problem. A wire, phone call or letter to our nearest office places this unique "know-how" at your service, without obligation.

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ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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NEW BOOKS

Pipefitters Handbook. By Forrest R. Lindsey. A pocket-size practical handbook written by a pipefitter for pipefitters. The book has been designed to provide quick and convenient answers to problems involving pipe bending, layout and installation. It includes tables on fittings, dimensions, angles, conversion factors, spacing of pipe hangers, soldering and brazing, mitering, and a dictionary of piping terms. Published by the Industrial Press, 148 Lafayette St., New York 13, N. Y. Pp. 282. Price $6.00

Aluminum in Iron and Steel. By Samuel L. Case, Technical Adviser, Battelle Memorial Institute, and Kent R. Van Horn, Director of Research, Aluminum Co. of America. Now that aluminum is assuming a major role in ferrous metallurgy, this exhaustive world-wide review of research on the subject is particularly timely. The first part of the book shows the favorable effects of small amounts of aluminum when added to molten steels as a deoxidizer. The second part of the book correlates data on the effect of aluminum as an alloying element in steel. Other chapters deal with aluminum in heat-resisting alloys, aluminum in permanent magnet alloys, aluminum coating of steel, and other uses of aluminum in steel. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 478. Price $8.50

Ferrous Analysis—Modern Practice and Theory. Second Edition by E. C. Pigott, Chief Chemist and Metallurgist, The Central Marine Engine Works, West Hartlepool, England. The gratifiying reception which the first edition of this text received, has led the author to bring it up to date. In response to critics of the first edition, he has included detailed methods for determining hydrogen, nitrogen, and oxygen in steels. Methods are described for the detection and determination of elements in iron and steel for some 31 elements ranging from aluminum to zirconium in the alphabetical list on the contents page. Numerous special instruments employing physical, optical, and chemical principles for the analysis of steel and iron are illustrated and described. Published by John Wiley & Sons, Inc. Pp. 690. Price $12.50.

Money Mountain—The Story of Cripple Creek Gold. Marshall Sprague, author of this colorful historical account of the Cripple Creek district, became so intrigued with the possibilities of a good story on this famous mining camp, that he spent considerable time combing libraries, news files, directories, court records and cemeteries for factual background information. He comes up with a rollicking good story, rich with character descriptions of drill runners, storekeepers, railroaders, madames, claim jumpers, mule skinners, soldiers, financiers, drifters, union organizers, gamblers, prospectors, lawyers, multimillionaires and others who just naturally gravitated to the world's richest gold camps of years gone by. (Cripple Creek ranks fifth in the world, with a total production of about $433-million.) Published by Little, Brown and Co. Boston, Mass. Pp. 342. Price $5.00.

Plane Surveying. Second Edition by Frank R. Theroux, Lisle A. Smith, and Leo V. Nothstine, all of the faculty of Michigan State College. A concise textbook suitable for elementary surveying courses. Published by Pitman Publishing Corp., 2 West 45 St., New York, N. Y. Pp. 407. Price, $4.75.

Principles of Physical Metallurgy. Third Edition by Gilbert E. Doan, Manager of Metallurgical Research, Koppers Co. The third edition is divided in three parts covering: The Physics of Metals, Metallography, and Metal Technology. Now that physical properties of metals can be explained in part in terms of electrons and atoms, sections of the book pertaining to this subject have been rewritten. Published by McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. Pp. 331. Price $5.50.

Fundamentals of Physical Science. By Konrad Bates Krauskopf. Professor of Geochemistry, Stanford University. In order to maintain a completely contemporary outlook, the author has revised numerous sections of this physical science survey. Intended for nonscience students, the text covers main facts pertaining to astronomy, physics, chemistry, and geology. Published by McGraw-Hill Book Co., Inc., 330 West 42 St., New York 36, N. Y. Pp. 694. Price $6.00.

Metallurgical Engineering. Volume 1, Engineering Principles. by Reinhardt Schuhmann, Jr., Massachusetts Institute of Technology. Three objectives of this book are: (1) Presentation of basic principles and unit processes of metallurgy, rather than classification according to metals treated. (2) Integration of the science of physical chemistry with metallurgical engineering, rather than treating these subjects in separate courses. (3) Emphasis on analysis and quantitative solution of engineering problems, with lesser emphasis on descriptive knowledge of current practices. Judging by the following items in the table of contents and related chapters, it appears that the author has moved boldly toward his objectives: Unit Processes of Chemical Metallurgy. Stoichiometry. The Heat Balance. Metallurgical Fuels. Combustion of Fuels and Heat Utilization. Fluid Flow. Steady Heat Flow. Unsteady Heat Flow. Phases in Pyrometallurgical Systems. Refractory materials. Published by Addison-Wesley Press Inc., Kendall Square, Cambridge 42, Mass. Pp. 390. Price $7.50.

The Induction Motor. Second Edition. By Herbert Vickers, Consulting Engineer, London. An introduction to the theory, design, and application of alternating-current machines including fractional horsepower motors. Published by Pitman Publishing Corp., 2 West 45 St., New York, N. Y. Pp. 529. Price $15.00.

The following reports may be obtained from the State of California, Department of Natural Resources, Ferry Building, San Francisco, Calif. at prices specified:

Geology of Southern Part of the Quail Quadrangle, Calif. Special Report 30. Pp. 18 plus maps. Price 75¢.

Geology and Ore Deposits of the Afterthought Mine, Shasta County, Calif. Special Report 29. Pp. 18 plus maps. Price 75¢.

Geology of the Saltdale Quadrangle, Calif. Bulletin 160. Pp. 65 plus maps.

Geological Investigations of Chromite in California. Bulletin 134. Part II.—Coast Range. By George W. Walker and Allan B. Griggs, Geological Survey, U. S. Department of Interior. Pp. 49 plus maps.

The following reports are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.:

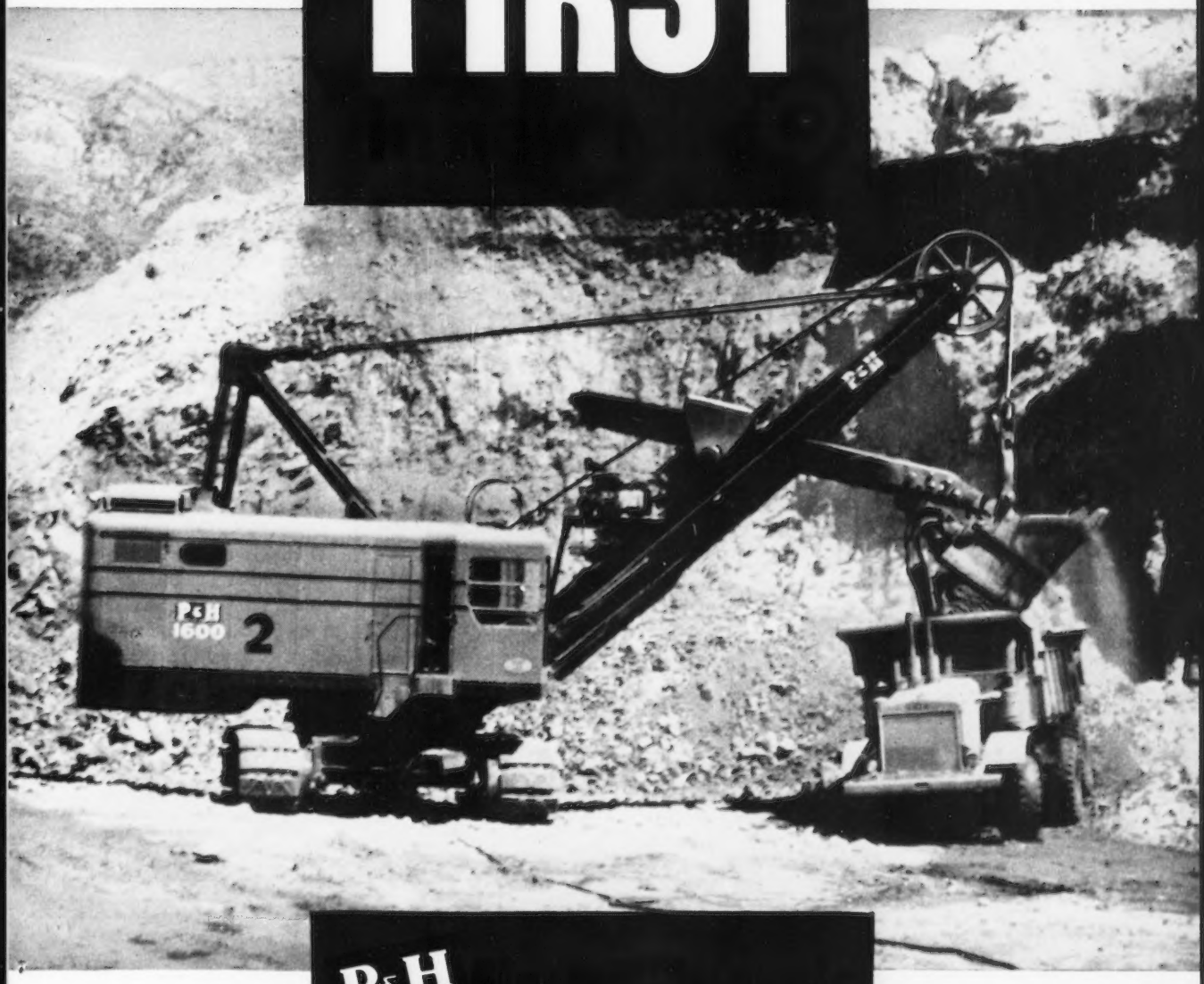
Limonite Deposits Near Scappoose Columbia County, Oregon. Geological Survey Bulletin 982-C By Preston E. Hotz. Pp. 18 plus maps. Price 65¢.

Iron Ore Deposits of the Iron Mountain District, Washington County, Idaho. Geological Survey Bulletin 982-E. By J. Hoover Mackin. Pp. 30 plus maps. Price not specified.

The following publication may be obtained from the U. S. Bureau of Mines Publications Distribution Section, 4800 Forbes St. Pittsburgh, Pa.:

R. I. 4918. Taconite Fragmentation. By Vernon C. Davis. Major subdivisions of this report are: Shaped Charges in Drill Holes. Shaped Charges in Secondary Blasting. Tests of Different Drilling Patterns and Methods of Detonation of Conventional Charges. Pp. 32 plus 119 fig.

FIRST



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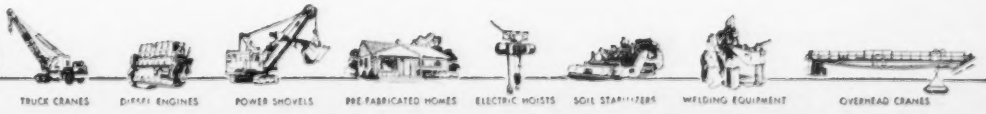

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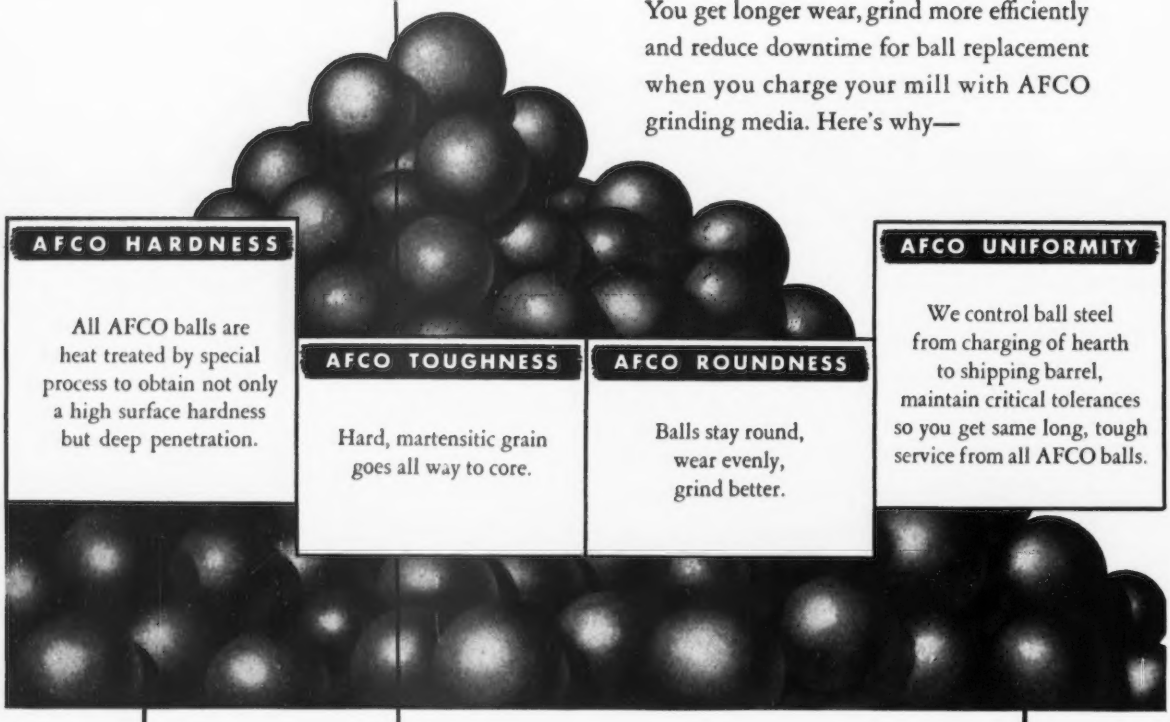

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THE M.S.A. MINEPHONE COMMUNICATION SYSTEM . . . answers mechanization's call for faster, safer HAULAGE OPERATIONS

Sending dispatcher's orders instantly and simultaneously to all motormen, who can reply or communicate with each other *while trips are in motion,* this modern underground communication system coordinates haulage movements with production demands . . . maintains smooth, continuous trip movements throughout the mine.

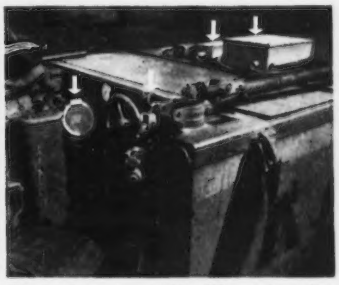
Messages, transmitted on an "open line" hook-up, keep the track clear for outgoing loaded trips and incoming empties. Keeping every trip on the move means less wear and tear on equipment; time is saved; injury is avoided.

Write today for complete details on this vital production aid.

Motorman reports his position at cross-over.

Motorman, ready to go into mine, asks for right of way.

Trip unloader advises conditions at his station.

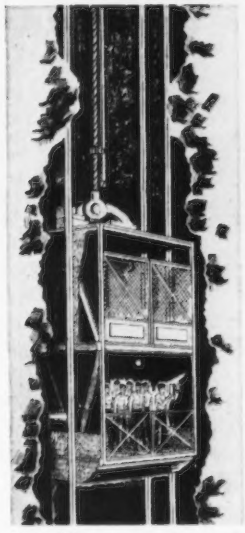


Typical compact MinePhone installation on top of locomotive.

THE M.S.A. HOISTPHONE COMMUNICATION SYSTEM . . . gives hoisting operations a lift . . . for greater production — safety

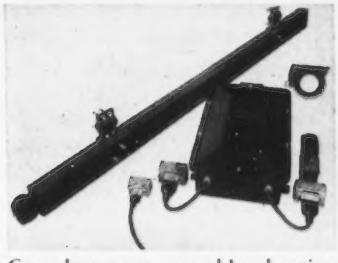
Here's the voice communication system that assures accurate, instant response between the hoisting engineer and cage. Whatever the job—load leveling—shaft repairs—shaft inspection trips—passenger transportation—the M.S.A. HoistPhone provides dependable, continuous voice communication at any level, and when cage is in motion.

The HoistPhone can be heard above noises of running equipment—is free of transmission noise and outside interference. Existing wiring, hoist cable and shaft frame can be utilized to carry the signal. It is simple to use—dependable in operation. Write for details on construction, flexibility, and design details.



HoistPhone permits positive control of the cage at any point in the shaft whether engaged in handling personnel, materials, repair or maintenance crews.

Hoist deck showing level indicator and M.S.A. HoistPhone. Voice control eliminates misunderstandings often caused by bell or horn signals.



Complete cage assembly showing transmitting and sending loop, transmitter-receiver, power supply box, microphone with control switch and speaker.

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Once is not enough!

The need for blood is greater than ever, not only for men wounded in combat, but here at home . . . to cure disease, to meet accidents and disasters, and to prepare for civil defense.

Our quota can ONLY be met, if those who give *keep on* giving . . . regularly!

You CAN give more than once . . . as often as every three months with complete personal safety. The more often you give the more often you save a life. For every pint of blood you give goes to someone who needs it desperately.

Remember . . . once is NOT enough. Give blood again and again! Call your Red Cross, Armed Forces or Community Blood Donor Center for an appointment to give blood today.

GIVE BLOOD

...give it again and again

BUSINESS EXECUTIVES!

CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOOD-MOBILE MAKE REGULAR VISITS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLAN BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . . the need for blood is **urgent!**

NATIONAL BLOOD PROGRAM

HAZACORD BULLETIN

HAZARD INSULATED WIRE WORKS • DIVISION OF THE OKONITE COMPANY, WILKES-BARRE, PA.

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New, Improved Grounding Conductor Gives HEX-TITE Added Flexibility

Hazacord HEX-TITE Type G, provides extra workability and flexibility in grounded cables. The grounding conductor is composed of many more fine wires protected by a cotton serving that forms a smooth channel through which the ground wire can work.

Special Lubricated Strand

Hazard's processing of the grounding strand permits the conductor to work freely without wear or danger of breakage of the strands. This added workability of the grounding conductor permits sharp bending of the cable without fatigue.

HEX-TITE Conductors Provide Exceptional Heat Resistance

Hazard Performite Heat-Resisting Insulation is used in all HEX-TITE Cable. It is suitable for operating temperatures as high as 75C. It provides a safety margin of about

New Hazacord HEX-TITE Twin Shuttle-Car Cable Promises Longer Lived, Lower Cost Trailing Cable Operation

Resisting internal twisting and slippage, new Hazacord HEX-TITE Twin Cable sets a new standard for trailing cable. Hexagonal insulated conductors provide six plane surfaces to form an extra strong mechanical bond with the protective Hazaprene ZBF Sheath. An open reinforcing braid over the hex-insulation is an additional guard against excessive pulling and dislocation.

Special Adhesive Bond

Hex-insulation in the new Hazacord HEX-TITE is treated with a strong adhesive bonding agent for further resistance to slippage within the sheath. Yet, this adhesive permits removal of the sheath for splicing and repair without tearing or damage to the conductor.

Hazard representatives throughout the mining areas have complete information on new HEX-TITE Twin Shuttle-Car Cable. You can also write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

Tough, Hazaprene ZBF Sheath First with Mine Operators

For real protection, new Hazacord HEX-TITE has the famous Hazaprene ZBF Sheath. It offers superior resistance to flame, oil, acid and mechanical damage. And this sheath is pressure-vulcanized in a continuous metal mold for a smooth, dense surface that resists abrasion and tearing. Proof of mold curing is the full description and official approval number P-104BM embossed in raised letters in the sheath.

Prevents Shorting

The rugged Hazaprene Sheath completely encases each hex-conductor, providing a barrier between power conductors and between power and grounding conductor on Type G. This protective wall prevents shorting when the cable is run over and compressed.

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For every grinding job you do, there's a Norton wheel to do it better . . . in less time . . . at lower cost. There's the right combination of abrasive, bond, grain size and structure for each application, above or below the surface. Check here:

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SAVE! With Norton regular 37 CRYSTOLON* WHEELS to provide top economy and efficiency for rough grinding gray iron and the non-ferrous metals. Typical specification 37C24-Q5V.

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You Can Dig and Bulldoze with HYSTAWAY!

Hystaway boom can be removed in *minutes*, keeping mast in place, for extensive bulldozing work. Or the Hystaway, including mast, can be removed in *less than one hour*, if desired. Remounting is just as easy and fast.

. . . and that means getting jobs done *faster* with less equipment

HYSTAWAY® is the *only* machine that performs excavator-crane work as well as bulldozing and other tractor service. The *only* excavating machine that keeps productive *all* the time. Because when HYSTAWAY isn't digging, it can backfill or do other bulldozing jobs by simply turning around and using the bulldozer. For extensive bulldozing, or other tractor work, the Hystaway can be removed from the tractor in a matter of minutes. It can then be remounted, when needed, in a short time. This means you get *more* out of your equipment investment; more profit from every working hour.

Other important Hystaway advantages: No tail swing, permitting digging against fences, walls and in other close quarters; heavy-duty diesel tractor engine power for faster digging; crawler tractor mobility and maneuverability. Hystaway can be mounted on new or *used* Caterpillar track-type tractors. Hystaways are in service all over the world. There is no other *machine like Hystaway!* Get full details from your Caterpillar-Hyster Dealer or write for Catalog 1235 to:

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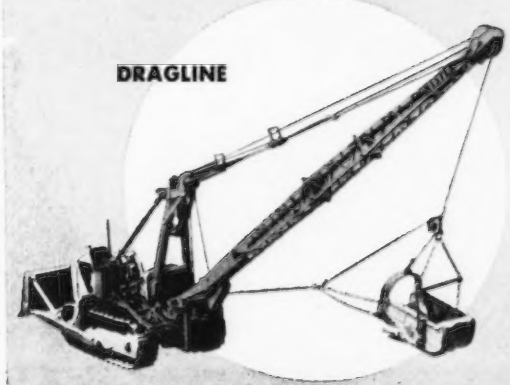

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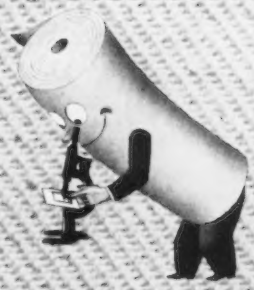

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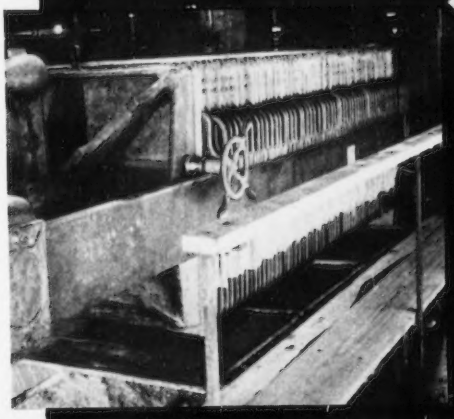

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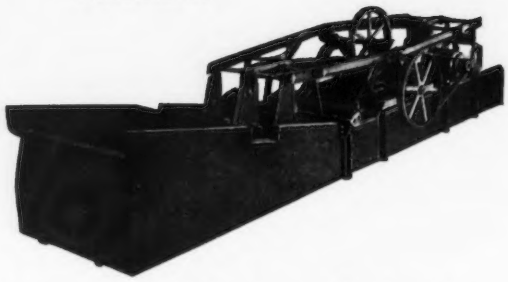

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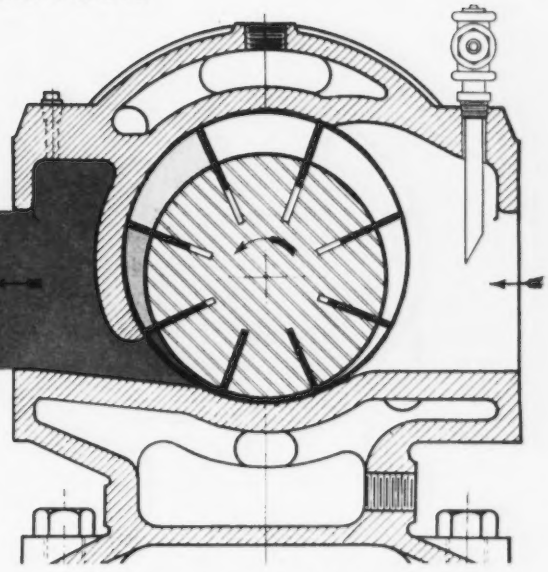

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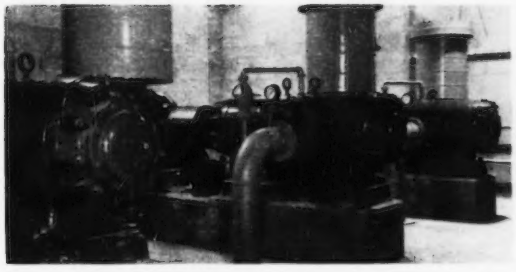

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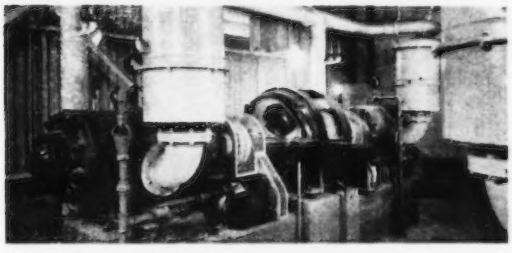

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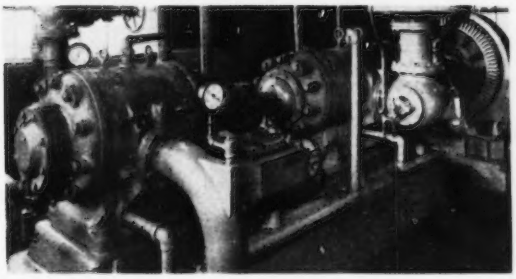

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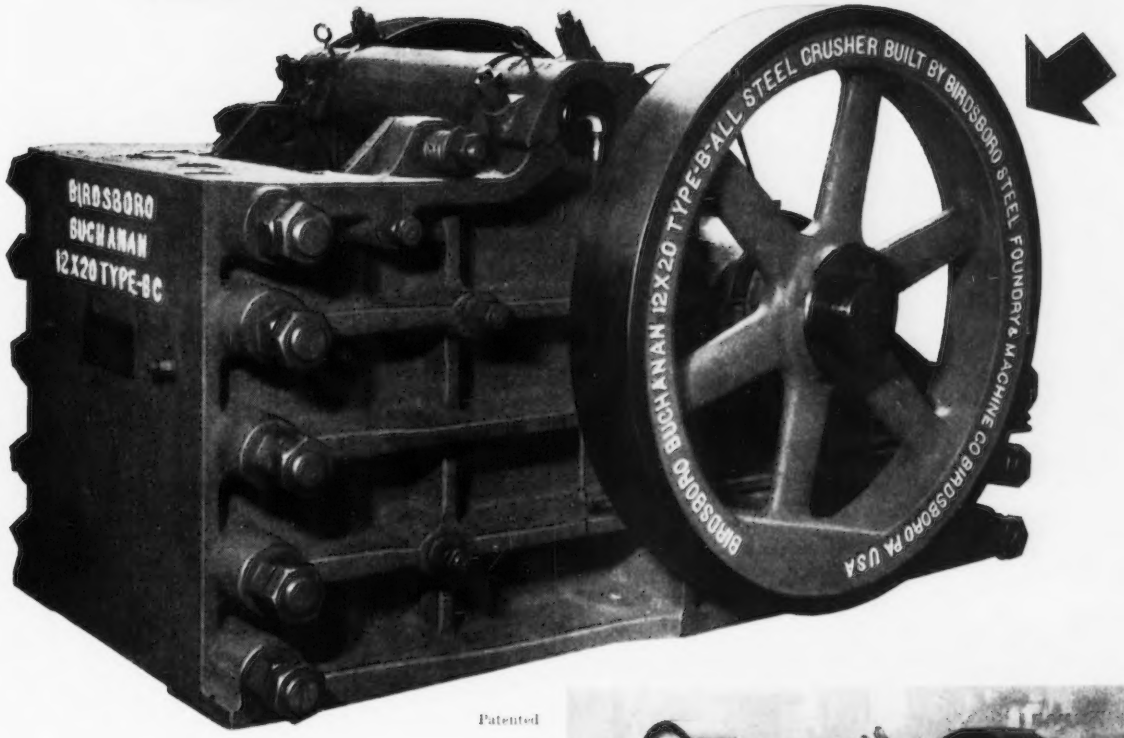
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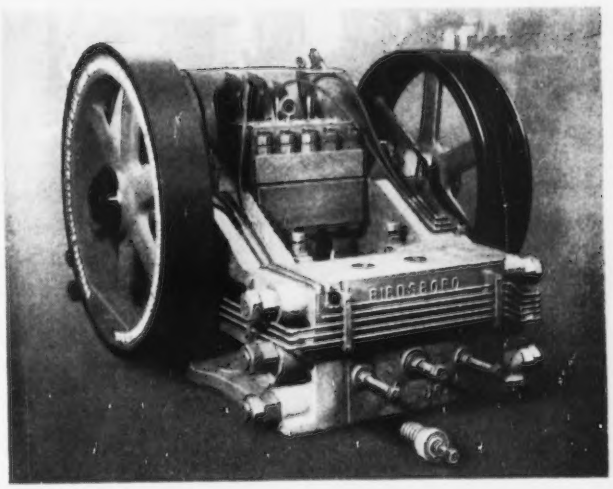

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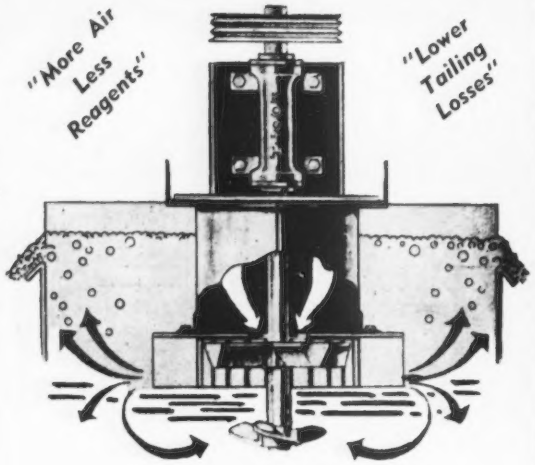

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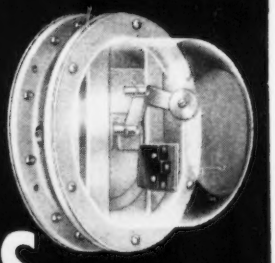

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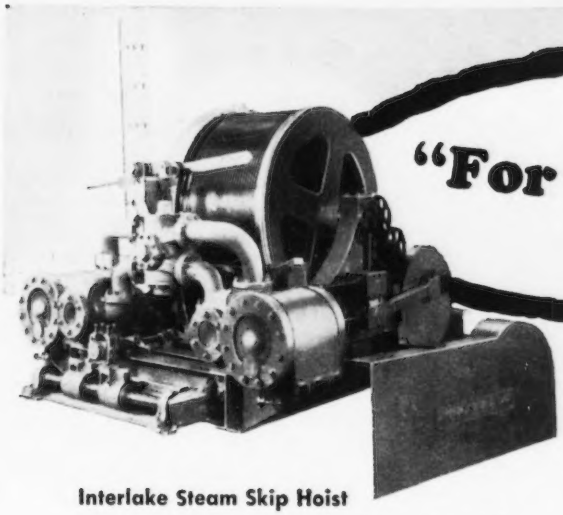

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1—8″ x 36″ Universal Jaw Crusher
1—11″ x 18″ Universal Jaw Crusher
1—24″ x 13″ Farrel Jaw Crusher
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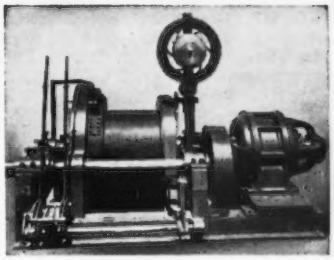

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20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
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26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
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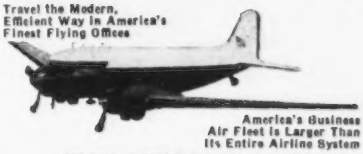

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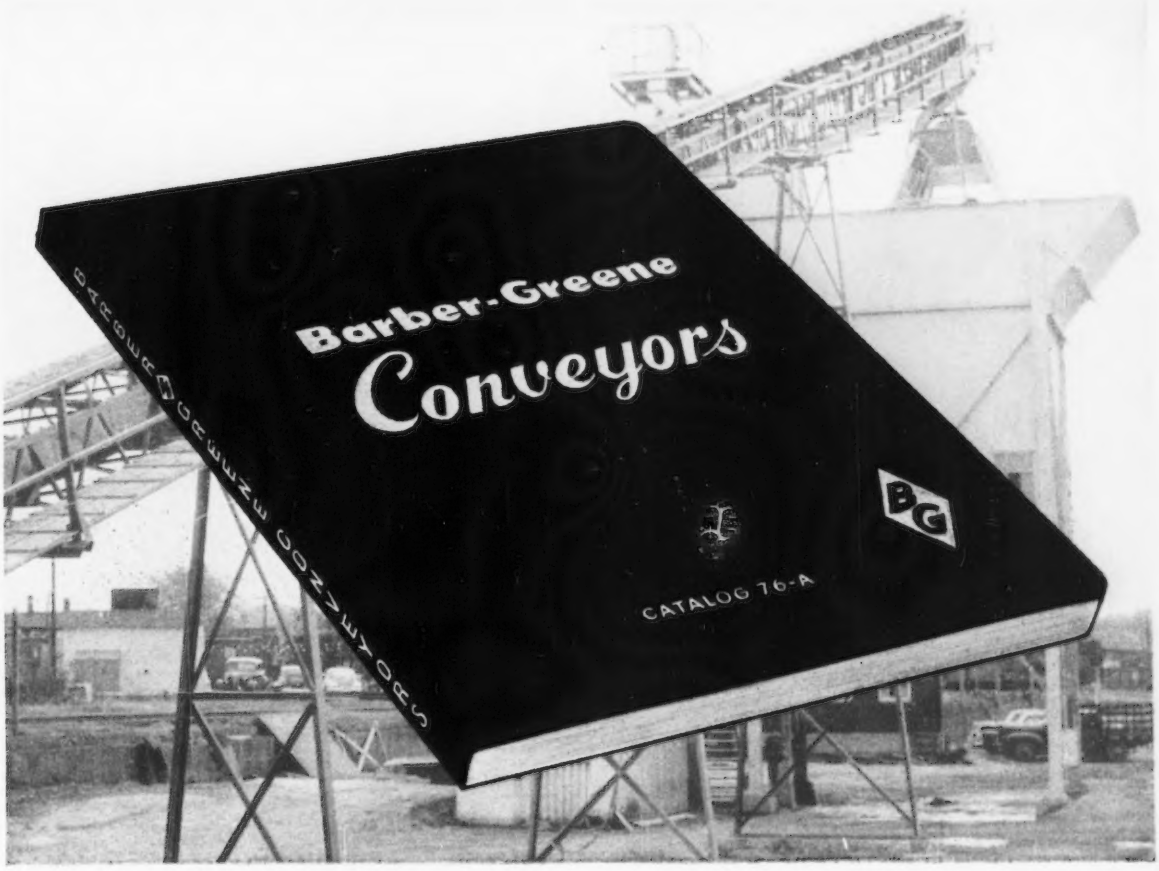

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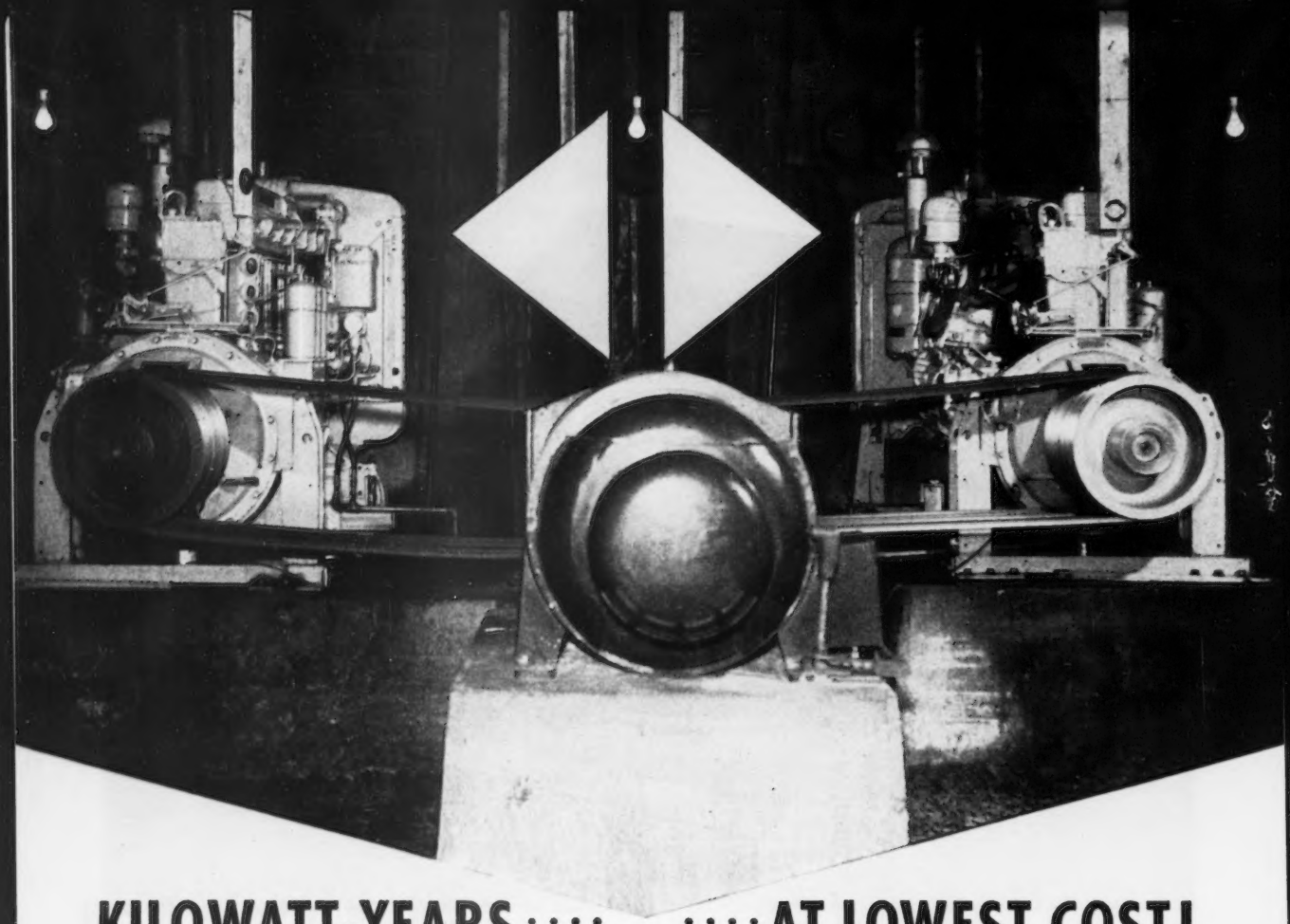

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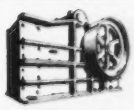
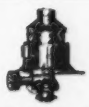
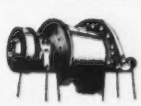


Jaw Crushers



Gyratory Crushers



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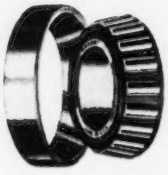

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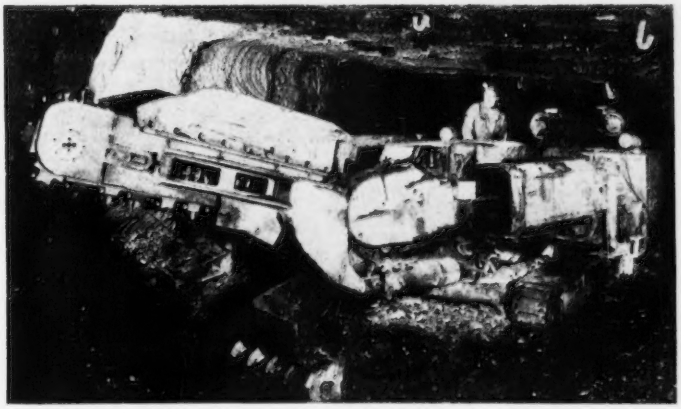
64 Timken bearings keep this Lee-Norse "Miner" on the go under the severest operation conditions.

Jeffrey's COLMOL uses 178 Timken bearings at vital points to insure trouble-free operation.



47 Timken bearings are used in this Joy 4 JCM continuous miner for long life with minimum maintenance.

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